A Formative Evaluation Of Augmentative And Alternative Communication Approaches To Promote Literacy In Young Children With Severe Speech And Physical Impairments

Thesis

UNRESTRICTED

"A FORMATIVE EVALUATION OF AUGMENTATIVE AND ALTERNATIVE COMMUNICATION APPROACHES TO PROMOTE LITERACY IN YOUNG CHILDREN WITH SEVERE SPEECH AND PHYSICAL IMPAIRMENTS"

A Thesis

Presented for the

Master of Philosophy Degree

Westminster College

Open University

Maria Margarida Nunes da Ponte

October, 1996

ProQuest LLC.
789 East Eisenhower Parkway
P.O. Box 1346
Ann Arbor, MI 48106 – 1346

TO ALL CHILDREN WITH SSPI

TABLE OF CONTENTS

PAGE

LIST OF TABLES

LIST OF FIGURES

FIGURES **PAGE**

LIST OF ABBREVIATIONS

AAC.....Augmentative and Alternative Communication

AT.....Assistive Technology

CP.....Cerebral Palsy

CRPCCG .....Calouste Gulbenkian Rehabilitation Centre for Cerebral Palsy

GRS.....Graphic Representational Symbols

PCS.....Picture Communication Symbols

PIC.....Pictogram Ideogram Communication

SSPI.....Severe Speech and Physical Impairments

TO.....Traditional Orthography

Acknowledgements:

I want to start by thanking my supervisors Barry Carpenter and Anne Hackney for their encouragement for my work and their efforts to make me feel at home in the Westminster College Community.

Tina Detheridge gave me a very special friendly and professional support that made possible a successfull completion of this Thesis. I am very gratefull to her.

Dr. Manuela Aguiar, in her capacity as Director of the Centre for Cerebral Palsy, made it possible for me to undertake this work, by allowing me access to the Centre and its children and by aiding the project at every turn. I take her cooperation to mean an appreciation for this investigation and thank her sincerely for that.

In addition, I want to express my gratitude to Dr. Graça Andrada whose constant sharing of her knowledge has taught me so much. Thanks also to Julieta Sá for her many years of friendship and productive collaboration. A special word of appreciation is further due to the team in charge of the participating children, especially the therapists, for their helpful cooperation.

This project would not have been possible without the children and their families, who participated so helpfully. I owe them my greatest respect and continuing encouragement.

This investigation has been generously supported by CAPS - a research centre of the Technical University of Lisbon - which has lent its well recognised and long standing experience in research in the field of Augmentative and Alternative Communication, and Assistive Technology for people with disabilities. I am truly grateful for their help.

To my friend Luis Azevedo a special vote of thanks for his confidence, support, and encouragement throughout this project. His positive expectations about the abilities of

children with severe speech and physical impairments have been an inspiration for my work and have led to the development of this research project. I have benefited immensely not only from his technical knowledge but, most of all, from his example of respect and great appreciation for the "differences" among different human beings.

I also want to take this opportunity to express my thankfulness to my classroom assistant Agostinha for 16 years of working together, always with great dedication, responsibility and professionalism. Thanks as well go to Bela and to Katie for their interest and help throughout this project.

My family has been deprived of my company and support during many hours, days, weekends, and long stays in Oxford. I am most grateful to them, for their understanding and their cooperation which has contributed immeasurably to this investigation. My husband, in particular, merits the deepest appreciation for his help and his belief in my work.

Finally, my last words of gratitude are the most important ones. They are addressed to all the children with Cerebral Palsy who have been my students during the last 16 years. They have been the best teachers I could have ever had.

Margarida Nunes da Ponte

Abstract

This thesis describes an educational intervention with three children with severe speech and physical impairments. The intervention focused on storybook reading experiences for early literacy development through the use of Augmentative and Alternative Communication technologies and methods. The review of literature focused on the main aspects relating to children with SSPI, and in particular on the difficulties they experience in developing emergent literacy skills. This review suggests the hypothesis that the use of AAC Techniques in storytelling achievement can provide emergent literacy experiences, which can promote the development of literacy in children with SSPI. In particular the study set out to enquire whether AAC techniques can be used to enhance participation with SSPI in storytelling activities, and whether such activities improve a pupil's opportunities to become emergent readers.

A six-month intervention was designed which included strategies proposed for increasing the children's participation during storybook reading sessions, like repeated readings of the same story, abundant use of graphic symbols and access to AAC techniques.

Qualitative data were gathered from the professionals at the Centre, and from the mothers. Storybook reading sessions with the teacher at school and with the mothers or significant other at home were videotaped, at the beginning and at the end of the intervention. Quantitative data were collected by videotape analysis. Communicative acts of children and adults were divided into communication categories, and their meaning was discussed as to form, use and content. One of the main conclusions of the study was that the use of stories promoting communication and language learning in storybook reading sessions can develop literacy skills if carried out in conjunction with AAC techniques, including graphic symbols and the technology to generate them. A second conclusion is that there is no automatic transfer of the improvement of communicative skills in the classroom to the interaction with the mothers.

Chapter 1: Introduction

"Thoughts of the Future"

What is the price of a Dream not dreamed?
What is the price of a Word not spoken?
What is the price of a Voice not heard?
What is the price of a Vision not imagined?
What is the price of a Life not lived?

Michael Williams (AAC user)
(cited in Blackstone & Pressman, "Outcomes in AAC", Alliance 95)

Speech is usually considered the normal way of expressing thoughts and feelings. For most people, face-to-face spoken exchanges are taken for granted as a means of communication that rarely receives conscious reflection. Such communication seems to develop naturally in social interaction and as a consequence of a biological potential. However, those people who are affected by language disabilities, are not able to develop natural communication in this way, especially people who have experienced such disabilities since early childhood.

This is the case with individuals with cerebral palsy. For example, in many of the cases, their neuromuscular condition affects their capability to use language in a functional way. In such cases, the same motor handicap which leads to speech loss affects other motor functions as well. Such people suffer reductions in co-ordination of both their fine and gross motor movements and most of them are dependent on wheelchairs for mobility (although the degree of impairment varies). This population is considered as having severe speech and physical impairments (SSPI).

Children with these types of motor disorders lose a significant part of the natural language teaching that other children take advantage of. For example, they are often unable to engage in the normal exchange of communicative acts with parents and other adults. As a consequence, they do not obtain the spoken reactions from those adults

that indirectly lead to language learning.

In addition to their difficulties in spoken communication, research exists demonstrating that children with SSPI are similarly unsuccessful in developing literacy, that is, in learning to read and write (Light, Kelford Smith & McNaughton, 1990; Koppenhaver, 1991). This is especially unfortunate since, as Blackstone (1989) argues, literacy, more than any other skill, is critical for people who cannot speak. Without it, language use remains extremely restricted and the person is trapped in a world of very restricted living options, without access to either educational or vocational opportunities.

Since the 1970s clinicians and educators have been turning to the ever-increasing body of information about normal language acquisition as a framework for developing better intervention programs for children with SSPI. These programs have had to resort to a series of techniques of supplementary or supportive communication that has come to be known as Augmentative and Alternative Communication (AAC). AAC systems comprise a communication system, such as pictures, symbols, or gesture, and a means of manipulating these communication elements, often refereed to as AAC Technology. For the purposes of this study, the discussion will focus on pictorial and symbol systems, rather than gestural.

In the past three decades great advances have been made in this field. This has been made possible by the development of communication aids. These aids provide a mechanism for the user to indicate symbols for communication purposes. In addition, professionals are developing new approaches to communication, which emphasise the function of communicative acts rather than their form.

Consequently, AAC (both the symbol systems and the technology) has emerged as a powerful tool for improving literacy development among people with SSPI, enabling them to be active participants during literacy events, communicating as well as composing and producing written text.

With this surge in the use of AAC the need to study the phenomenon is now being recognised. AAC symbols, techniques and user strategies need to be better understood and research in this area is becoming a priority.

The focus of much of the research has been on the development of communication, rather than its extension into the acquisition of literacy for the population of children with SSPI. That which does exist has mainly focused on adolescents and adults paying little attention to pre-school AAC users. Nevertheless, evidence is mounting suggesting that such children are often capable of developing sophisticated reading and writing skills (Light, Lindsay, Siegel, & Parnes, 1990; Koppenhaver & Yoder, 1991; Creek, 1988; Kelford-Smith, 1989).

This ray of hope comes in contradiction to well documented observations of the problems faced by children with learning difficulties in the literacy acquisition process (Schonell, 1956; Perry, 1960; Killilea, 1983). Research demonstrates, for example, that 50% of children with cerebral palsy of average or above average intelligence still experience severe literacy learning difficulties (Barsch & Rudell, 1962; Center & Ward, 1984; Danilova, 1983; Seidel, Chadwick, & Rutter, 1975).

Some investigations have looked at the reasons for this "under achievement". For example, a review of recent research (Koppenhaver & Yoder, 1992) suggested that the severe literacy-learning difficulties experienced by 70% to 90% of AAC users may be related as much to the quality of environmental demands on the individual abilities as they are to the nature of the individual disabilities. Light & McNaughton's research (1993) suggested that such difficulties might be partly attributed to the way in which parents and professionals responded to learners' disabilities. Koppenhaver & Yoder's (1993) work echoed that theme, suggesting that the learning context may influence the learning process.

Despite individual and contextual limitations, however, research does exist demonstrating that AAC approaches (symbolic systems and assistive technology) can

help promote literacy development in children with learning disabilities (Coleman, Koppenhaver & Yoder, 1991; Musselwhite, & King DeBaun, 1993; Nunes da Ponte & Azevedo, 1993; Strickland and Morrow, 1989; Teale and Sulzby, 1986).

The purpose of the study described in this thesis was to further illuminate trends in the use of Augmentative and Alternative Communication which might promote literacy development in children with learning disabilities. It was mainly inspired by research (King De-Baun, 1990) on the effectiveness of the use of stories to emphasise language concepts through a graphic medium.

This study was guided by a definition of literacy as being made up of the interaction of reading, writing, speaking, and listening abilities that develop concurrently and interrelatedly, rather than sequentially (Koppenhaver et al., 1991; Maehr, 1991; Teale & Sulzby, 1989). According to this framework, children's behaviour (and especially that during story reading) is seen as being a significant contribution to their emerging literacy. It is maintained that children develop those behaviours, which serve as the foundation for conventional literacy, by playing with literacy: participating in story reading, drawing and scribbling, observing literate people reading and writing to accomplish goals.

As may be expected, children who use AAC may have intrinsic and extrinsic characteristics (physical, sensory, cognitive, and communicative) that influence their behaviours affecting both the quality and quantity of interactions taking place during story reading.

From the intervention point of view, it is necessary to engage AAC users in such literacy events as frequently as possible, making sure that they learn from their participation. Assistive Technology can provide avenues for many of the experiences necessary for the emergence of literacy by enabling SSPI children to interact with the reader and to obtain access to other aspects of the reading experience. This must be accomplished in spite of these intrinsic and extrinsic characteristics unique to children who use AAC and which affect both the quality and quantity of story reading

interactions.

One recent descriptive study of the interaction patterns of preschool AAC users and their mothers during storyreading (Light, Binger & Kelford-Smith, 1994) provided some insight into the experience of children with SSPI. The authors described exchanges in which mothers and children shared the same focus in the interaction; however, the exchanges were asymmetrical and mother-dominated, and the children forfeited many of their communicative opportunities. The authors concluded with an urgent appeal for more research into early literacy development of those children.

The use of AAC, including graphic symbols and assistive technology, can facilitate interaction, and language development. It has further been shown that the use of stories to facilitate interactive communication, can provide early literacy experiences.

These findings suggest the following hypothesis:

- *The use of AAC techniques in storytelling achievement, can provide emergent literacy experiences, which can promote the development of literacy in children with SSPI.*

This hypothesis poses two key questions:

- Can AAC techniques be used to enhance participation by children with SSPI in story based activities?

- Does participation in story reading activities improve such pupil's opportunities to become "emergent readers"?

In considering these questions, the next chapter will review the literature on the development of communication and assistive technology, and on the development of language and literacy.

Chapter 2:
Review of Relevant Literature

2.1. Introduction

This chapter considers the literature on aided and augmentative communication and its role in the development of literacy. It begins with Communication and Language, before considering the specific issues related to children with SSPI, including Aided and Augmentative Communication. In discussing the particular factors in the development of literacy the chapter considers the importance of literacy, the emergence of literacy, finally focusing on the approaches which may be appropriate. Following are some definitions considered important within the context of this study:

Communication

This is defined as the process of the transmission of a message from one person to another, with participants influencing each other in the course of the exchange. It involves many different behaviour modes: speech, gestures, actions, pointing, facial expressions, body orientation, conventional signs, pictures, symbols.

Language

As stated by Donaldson, M. L. (1995), language is a system of arbitrary, conventional symbols used to convey meanings. It refers to our ability to manipulate those symbols. A symbol is something that stands in place of something else, whether that will be an object or a concept, called its referend (Vanderheiden & Yoder, 1986). It may take various forms, e.g. spoken, written, manual signs. Languages are symbolic (semantic) and have formal grammars (rules for combining symbols) and conventions for how to use language (pragmatics).

Literacy

This is the process by which people learn to interpret meaning encoded in print and translate meaning into print (text) (Blackstone, 1989). This process emerges as a result of the social interaction as children observe reading and writing and the mediating cognition used to accomplish goals.

Literacy events

As defined and operationalized by Anderson and Person (1984), these consist of any action sequence involving one or more persons in which the production and/or comprehension of print plays a role. They identify two types of literacy events: first reading events are those where a graphically encoded message is comprehended; secondly writing events occur when an individual produces those graphic signs, encoding spoken language.

Children with SSPI

Some children with cerebral palsy have a severely impaired control of the muscles involved in speech production resulting in articulation problems (dysarthria) or in a complete inability to speak (anarthria). On the other hand their physical abilities are severely affected, making them totally dependent on others for mobility, feeding, toileting and others areas of development. They are considered as having severe speech and physical impairments (SSPI). Because of their severe physical impairment, they cannot use manual gestures or signs as a mean to communicate in the way that many individuals with other types of communication and language disorders can.

AAC User

An AAC user or potential user, is a person who needs to communicate in face to face interaction in other ways than through speech. No matter what the limitations on their speaking abilities might be, they still develop language.

In the context of this study, the use of other ways of communication is mainly restricted to natural modes and to the use of graphic symbols and adequate technology to support or select them. Because of their severe physical impairments, manual signing is not a realistic and reliable means of communication for the group of AAC users, or potential users, who are addressed by this study.

2.2. Communication

Communication is a complex process of information transfer that individuals use to influence the behaviour of others (Orelove and Sobsey, 1993). It involves the transmission of a message (thoughts, feelings, ideas, needs) from one person to another, with participants influencing each other in the course of the exchange. The purpose of communication is to share information, to express needs and wants. In fact, communicative skills are critical for developing and maintaining social relationships, for learning, community living, and in general for the satisfaction of almost all human needs. Communication is an ongoing process that occurs throughout daily activities in a natural environment.

Communication may be accomplished by means of speech, gestures, actions, pointing, facial expressions, body orientation, conventional signs, pictures, symbols or words. According to the work of Kiernan, Reid & Jones (1982) and Kiernan, Reid & Goldbart (1987), communication presupposes that one has:

- something to communicate;
- someone with whom to communicate;
- a means to communicate;
- a reason to communicate;
- an understanding that communication can influence others.

Face to face spoken communication has presumably been the primary mode of communication during most of human existence, and it is, in that sense, the normal mode of communication (Hjelmquist, 1990).

Syder (1992) describes how powerful our desire to express ourselves is and explains that it originates from basic drives to satisfy both our physical and emotional needs. It is necessary for us to interact with other human beings for survival, support and stimulation. In fact, for emotional health we simultaneously have to do two almost

contradictory things: to define ourselves as part of a social group and yet, at the same time, as individuals having a unique identity.

For all these purposes, speech is a powerful mean of communication, and therefore an integral part of our conceptualisation of humanity.

2.2.1. Language

Little, if anything, is known about the cultural variation of linguistic communication during prehistoric times. Only since a qualitative step was taken about 5000 years ago, when external media began to be used for communication, do we have some patchy information.

Writing has brought a new dimension to human communication, a cultural dimension differing from that of oral communication. Hjelmquist (1990) reminds us that it is no longer possible to talk about normal communication in any straightforward way. Writing is a cultural artefact, a "technical" innovation, which has developed into many variants. It is a new way of preserving information and knowledge. Reading and writing are now normal in the sense that they are highly valued within certain cultures, representing norms which should be striven for.

However valuable these means of communication are for all of mankind, they are especially so for those individuals who are unable, for any reason, to communicate by speech.

2.2.2 The Central Nervous System: Relation to Language

Spoken language does not emerge in children simply because they have reached a particular age. According to several authors (e.g. Lenneberg, 1967; Andrada, 1989;

Damásio and Damásio, 1992) the first condition for language seems to be an adequate neural substrate and intact neurological processes. In fact, child language development can be conceptualised (Andrada, 1989) as a complex mechanism that depends on different factors:

- the integrity and maturation of the central nervous system,
- the integrity and maturation of the sensory motor system and of the phonatory organs whose enervation depends as well on the central nervous system,
- the quality of the relationship with the environment which depends on social and affective factors,
- the linguistic skills that are going to be integrated which is influenced by social and cultural factors and environmental stimulation.

While Andrada's concern centres on the role of neurological mechanism in mediating between the individual and his/her socio-psychological stimuli for language development, Damásio and Damásio's (1992) approach emphasises the processes by which the brain works to process and produce language. They outline three interacting sets of structures:

1- A large collection of neural systems in both the right and left cerebral hemispheres represents non-language interactions between the body and its environment, as mediated by various sensory and motor systems (anything that a person does, perceives, thinks or feels while acting in the world).

2- A smaller number of neural systems, generally located in the left cerebral hemisphere, represent phonemes, phoneme combinations and syntactic rules for combining words. When stimulated from within the brain, these systems assemble word-forms and generate sentences to be spoken or written. When stimulated externally by speech or text, they perform the initial processing of auditory or visual language signals.

3- A set of structures, also located largely in the left hemisphere, mediate between

the first two.

Various brain areas are known to be associated with language. The left brain is usually thought to be dominant for language, however, there is evidence (Hackney, 1981) that the right brain is not void of language functions. Carpenter (1990), for example, cites several studies that indicate that the right hemisphere is more adept at processing visual spatial information, which would indicate why symbols and printed words are a viable means of increasing the lexicon store of individuals with left hemisphere lesions. In fact, various authors postulate that in the very young child, linguistic ability begins to develop in both hemispheres but when cerebral dominance is established there is an inhibiting or regression of linguistic function in the non-dominant, usually right hemisphere (Gazzaniga, 1974; Milner, 1968; Popper and Eccles, 1977).

This theory would help to explain why language function is so easily assumed by the right hemisphere in young children with left hemisphere damage. However, Lenneberg (1967) maintains that infants' amazing plasticity and flexibility in providing new circuits for language in the case of localised brain damage, is obtained only during the natural language maturation period. He argues that by the age of about ten or eleven, language function is fixed and transfer will not take place. This provides a rationale for early intervention for literacy development in children that have suffered brain damage, as in the case of those suffering from cerebral palsy.

2.2.3. Language and Cognition

" The limits of my language mean the limits of my world"

Ludwig Wittgenstein

(cited in Musselwhite & St. Louis, 1988)

Cognition can be defined as the total set of mental processes and data that are used to build internal models of our environment (Hackney, 1981). The interaction between

cognitive development and language acquisition has long been recognised and the direction of causality highly debated. Inhelder and Piaget (1964), for example, considered language to be an important element in the development of cognition. For their part, Vygotsky (1962) argues that the two processes seem to be interdependent and simultaneously connected. Also Andrada, (1989) defends the inseparability of language and cognition, and Lenneberg (1969) sees language as an integral part of cognition being neither cause nor effect.

The model of the components of communication presented by Luria, (1977) helps structuring the relation between cognitive abilities and linguistic competence. He presents six components of communication:

- The wish to communicate is strongly related to emotions and being alert and awake.

- The idea/thought constitutes "the something that needs to be communicated. It is multisensory based. It includes all the impressions and associations which rise in one's mind. Efficient use of all senses and a tool to name/label the sensory impressions when stored contributes to rich ideas and thoughts.

- The internal speech is a process of selecting elements from the idea and planning the message. Elements relevant for the situation, the purpose of the message and the knowledge of the listeners are chosen from the idea.

- The deep syntactic structure of the message means that all the different parts are organised in a logic grammatical structure. The sequenced plan for the message is made.

- The surface syntactic structure of the message is culture specific. The words are ordered and linked to each other according to the rules of the specific language. The cognitive process between deep structure and surface structure (e.g. preparing for articulation or for graphic symbols) is different for different

languages, and depend also on each individual's cognitive strengths and weaknesses in the network of skills contributing to the whole.

- Finally, the expression when it is spoken.

The close interrelationship between language and cognition is especially important in the case of children with SSPI, for whom language acquisition proceeds through different channels and means than for most other children. Thus, it becomes natural to ask how the "internal models of our environment" build up for those who have to resort to AAC techniques to be able to learn language and express themselves.

At the same time that cognition develops hand in hand with language, Trevarthen (1983) says that language only makes sense in a pragmatic context of interpersonal social relationships. This use of language (pragmatics) is fundamental to effective communication, yet the rules are not intuitive. As is often the case when a person obtains an augmentative communication system for the first time, he/she may not understand well enough how language is used for it to be effective, and consequently extensive training may be required in order to develop adequate strategies of use.

In the words of Cook and Hussey (1995), "No matter how many words a person knows, they are not functional unless he or she knows when and how to use them to convey ideas."

2.2.4. Speech and Language

Speech and language are terms often used interchangeably. However, Syder (1992) has pointed out that they are not synonymous and that we need to distinguish between them. Speech is, in fact, the oral expression of language, while the term language is more general and refers to our ability to manipulate symbols. A symbol is something that stands in place of something else, whether that be an object, or a concept.

Cook and Hussey (1995) describe in detail the development of language, beginning very early in the child's life. At 1 or 2 months, an infant can distinguish between speech and non-speech sounds and there is an inherent predisposition to be interested in communication (Miller, 1981).

First vocalisations appear at 10 to 15 months and are primarily used to attract attention. In fact, vocalisations during the first year are generally used more in play than in a communication context, and the child develops a greater variety of sounds than are needed in adult speech. First words are typically tied to gestures such as the direction of eye gaze. The direction of gaze leads to arm or other limb movement in the direction of the object, and this leads to vocalising until the object is given to the child and he/she can manipulate it. The linguistic functions of requesting and asserting that are performed by gestures are those later performed by oral language. During the second year, vocalisations and communication begin to merge as the child learns to control the vocalisations sufficiently to communicate ideas and manipulate his world. At 16 to 18 months, vocalisations have several communicative intents. By 2 years of age the child has begun to develop imaginative uses of language and to explore its manipulative potential.

2.2.5. Language Disabilities

For someone who is affected by a language disability, spoken communication is obviously not a direct and normal way of expressing thoughts and feelings. The major causes of the inability to speak and/or write are neuromuscular conditions (such as cerebral palsy, mentioned above), degenerative diseases (e. g. amyotrophic lateral sclerosis), traumatic brain injury, stroke, or high-level spinal cord injury. Other situations can also prevent people from forming the sounds necessary for speech (e. g. larynx damage from trauma or cancer).

Alternatively, there are many individuals who can make sounds but have insufficient control of the muscles of the chest, diaphragm, mouth, tongue, and throat to form these sounds into understandable words. As the functional organisation of the central nervous system is individualised in several ways (Edelman, 1987), each of the conditions referred to can produce unique characteristics for each individual person' s disability.

2.3. Children with Severe Speech and Physical Impairments (SSPI)

As previously defined in chapter I of this thesis, there are some children with cerebral palsy that have a severely impaired control of the muscles involved in speech production resulting in articulation problems (dysarthria) or in a complete inability to speak (anarthria). On the other hand their physical abilities are severely affected making them totally dependent on others for mobility, feeding, toileting, and others areas of development. They are considered has having severe speech and physical impairments (SSPI). Their severe physical impairment, prevents the use of manual signs as a mean to communicate.

2.3.1. Early Interaction and Children with SSPI

The importance of social interaction in children's development has been repeatedly stressed (e.g. Vygotsky, 1978; Bruner, 1983). In the case of individuals with disabilities, however, this interaction can be totally affected. (Light, 1985; Light et al., 1994; Basil, 1992). The first problem, extensively described by Von Tetzchner and Martinsen (1992), is that children with extensive motor disorders lose a significant part of the natural language teaching that other children have. Able bodied children in the pre-lingual period produce a series of noises and behaviours, like crying, smiling, and laughing, that make parents or other caretakers react and speak to them, leading, indirectly, to language learning. On the contrary, children with motor handicaps may not be able to smile or vocalise. Their signals may be unclear and fairly inconsistent, and liable to be misunderstood by their parents. While the parents may become frustrated, constantly irritated and feel inadequate, the children often develop helplessness and give up any attempt at communication.

Citing other authors Von Tetzchner and Martinsen (1992), illustrate a second problem relating to the movements of children with SSPI. These children exhibit both reflex and involuntary movements which can affect their reactions to people and events (Morris, 1981). Bottorf and DePape (1982), for example, describe how sideways head movements associated with the tonic neck reflex can be interpreted by adults as a lack of interest or rejection of a person or object. Whereas Burkhart (1987) warns that these children are often regarded as more alert and interested when they are tense than when their muscle tone is low.

Therefore, these children's physical disabilities place considerable restrictions on their personal development. There are activities in which they will be unable to participate, and many fields where they will gain only limited experience. Part of this limitation is caused less by the motor handicap than the fact that, due to negative experiences, they believe they are unable to do anything. For example, in a study of mother-cerebral

palsied child interaction (Shere and Kastenbaum, 1966) it was found that the children's difficulties in moving and speaking combined with the influence of their environment to developing a passive style. As such children accumulate failures, they stop trying to do things that they might have been capable of. They learn that they are dependent on others because others do things for them which they would be unable to manage alone, and they adopt a passive communication style, becoming helplessness (Basil, 1992).

Adults' typical attitudes to these children play a significant role in forming their life and opportunities for personal growth. Ryan (1974) and Lock (1980), for instance, stress how important is caregiver over-interpretation for children's language development. Parents or other caretakers act as though a child is communicating something specific, before it is reasonable to assume that she/he is really communicating. By reacting to the child's activities in this way, they create conditions in which he/she will learn to communicate. Children with SSPI display, however, very few such "legible" activities, as Von Tetzchner and Martinsen (1992) point out, and do not obtain enough over-interpretation from their parents. This fact leads to a much poorer learning environment.

Many studies (those cited above, as well as: Bjorck-Akesson, 1993; Brodin, 1991; Harris, 1982; Heim, 1989; Granlund, 1993; Light et al. 1985a, 1985b; Light, 1988; Udwin & Yule, 1990) have concluded that children with motor disorders lose out on many language learning experiences common to their able-bodied peers which, in turn, may lead to reduced language comprehension and less knowledge about their environment. These children often have a poorer language environment that affords less reaction to them than it would to normally developing children. Language comprehension may also be reduced, even though the neurological basis for language acquisition has not been affected.

2.3.2. Emerging Communicative Intents

People without disabilities supplement their messages by using gestures, facial expressions, eye-gaze and vocal inflections and intonations. At times, these nonverbal methods may be used to replace speech entirely. The person with a disability that causes a severe communication impairment may need to rely almost exclusively on the use of nonverbal modes.

Siegel-Causey and Downing (1987) used the term nonsymbolic communication to refer to the use of gestures, vocalisations, eye contact, facial expressions, and body movement used to communicate. Individuals who use non-symbolic communication transmit messages using movements and behaviours. Siegel-Causey and Ernst (1989) differentiate nonsymbolic communication into nonintentional and intentional forms of communication. Nonintentional communication refers to reflexive or involuntary behaviours that are not used specifically to communicate, but are significantly inferred by others to have meaning. In contrast, intentional nonsymbolic communication behaviours are used specifically to affect another's behaviour. There are inherent difficulties in distinguishing between intentional and non-intentional gestures and behaviours in people with severe disabilities. This will be informed by familiarity, so for example, if an individual displays a history of using a gesture in the absence of an attending listener, it is fairly safe to conclude that the gesture is not intentional.

On the other hand, Rowland and Stremel-Campbell (1987) use the terms preintentional, intentional, presymbolic and symbolic to describe the sequence in which expressive communication behaviours develop in all individuals. Preintentional behaviours are reflexes or involuntary reactions to stimuli. While the individual does not perform the behaviour deliberately in order to affect another's behaviour, these actions are often interpreted as being communicative.

Intentional behaviours differ from preintentional in that the individual engages in these

behaviours voluntarily. However he or she does not engage in the behaviours to exert control over another's behaviour, although these actions, like preintentional behaviours are interpreted as communicative. During the nonconventional presymbolic stage, the individual becomes aware of the power his or her behaviour can exert, and deliberately uses gestures, eye contact, and vocalisations for a variety of communicative functions including refusal.

The next stage considered by Rowland and Stremel-Campbell (1987) as conventional presymbolic communication is characterised by the use of widely recognised gestures, with meanings agreed upon by others from the learner's culture. When the individual demonstrates an ability to pair a symbol with a referent, he/she is considered by these authors to be at the conventional symbolic communication level. At this stage, the individual is able to use highly recognisable and guessable gestures and symbols to represent objects found in the environment. Abstract symbolic communication involves the use of symbols that do not bear a direct relationship to their referents. This level is characterised by the use of single words or signs.

Finally, formal symbolic communication emerges, during which time the individual produces multiword utterances according to grammatical rules.

Traditionally children have been said to engage in communicative behaviour when they engage a listener with the purpose of conveying intent. Stillman, Alymer, and Vandivort (1983) argue that communicative behaviours are contingent upon the presence of a desired object or event or upon the presentation of an undesired event regardless of whether a listener was present to receive the message.

Bates, Camioni and Volterra (1975) identified three stages in which intentional communicative behaviour emerges in children without disabilities. The prelocutionary stage is when an adult assigns intent to actions of a learner that may not have been directed to a listener. When an infant fusses, one may conclude that he or she is hungry. As infants mature, they begin to produce these same behaviours, but may

begin to alternate their attention between the referent and a prospective listener. This is what the above authors refer to as the illocutionary stage in which instances the learner intended to convey a message to the listener. Eventually specific linguistic forms emerge that are clearly intentional, which are refereed to by the previous authors as locutionary acts.

Perlocutionary behaviour has been described as the production of discrete voluntary behaviour that is interpreted by a listener as conveying intent. According to McLean, J.E., & Snyder-McLean, L. (1988), these prelocutionary behaviours tends to precede the intentional communicative behaviour, in both normally developing and intellectually delayed populations. From a practical view, perlocutionary behaviours are less efficient than intentional behaviours. Nevertheless, a significant body of literature suggests that for individuals with very severe disabilities perlocutionary communication may be far more efficient than no functional communicative behaviour.

In the case of people with severe disabilities, McLean and Snyder-McLean, (1988) observed three levels of intentional communicative gestures. The first level, referred to as primitive communication signalling behaviour, consists primarily of actions directed toward people and objects. Included in this level are behaviours such as reaching for an object, pulling away from stimuli, gesturing with objects and grabbing at another's hand or placing someone else's hand on an object.

The second level of early communicative behaviour, referred to by these authors as conventionalised behaviour, includes gestures that are not accompanied by contact with an object or person (e.g.: pointing at objects or persons, accompanying gestures with vocalisations, and occasionally producing a few manual signs or words in the presence of their referents.

The last level referred to by the authors as referential communication, is characterised by the use of five or more manual signs or words and numerous gestures used spontaneously and produced in the absence of their referents.

All these descriptions of emerging gestures share many common features. Mustonen, et. al. 1991, state that all modes of communication (vocal, gestural and graphic) that can be functional for a particular individual should be learned and used simultaneously.

2.3.3. Functional Communication: demands and opportunities

Traditionally, the content of many language intervention programs was based on the literature on normal language development. This developmental approach may be appropriate when intervening with very young children. On the other hand, this type of approach used with older students, may often have little relevance to their daily lives. Communication demands and opportunities vary with age, and most important, depend to a great extent upon the nature and diversity of the daily environments in which individuals are functioning.

In order to establish communication skills that enable students to participate more effectively in their daily lives, a functional approach to communication must be adopted, (Sigafoos, J., & York, J., 1991).

With this approach, intervention priorities for people with severe disabilities are based upon the unique characteristics of the individual learner, as well as upon the demands and opportunities of the various environments in which the learner is expected to function.

Various types of information needed in designing communication intervention can be derived from natural environments using ecological inventory strategies. To begin with, there is a need to identify demands and opportunities related to the environment as the basis for determining priority targets for instruction. After priority instructional strategies have been identified, additional information such as natural cues and consequences, is derived from the environment and must be used in designing an

instructional program.

A properly conducted ecological analysis provides a detailed picture of the communicative demands found in relevant environments. Some of these demands may be obvious, others may be more discriminating because they may be contingent demands, more related to the specific environment or activities. Different activities will often call for different types of communicative functions (e.g.: requesting, rejecting, commenting) A single activity will often require the use of multiple communicative functions.

The application of the normal developmental model to children using AAC systems raises strong concerns (Gerber, & Kraat 1992; Letto, Bedrosian & Skarakis-Doyle, 1994). In fact, researchers and clinicians concerned with language acquisition in young children with severe speech and physical impairments are faced with the fundamental problem of how to conceptualise their acquisition process.

Hjelmquist (1990), for instance, suggests that children using AAC might never experience communication with language as a transparent phenomenon in the way able bodied children do, who can concentrate on communicative goals, rather than the communicative means, since they have mastered spoken communication. AAC users, on the contrary, are forced to communicate via external aids and techniques and to treat communicative messages as objects in very concrete ways.

Relying on AAC, children have to master the external means before they can express their intentions and goals. Furthermore, as Harris and Vanderheiden (1980) point out, "non vocal" techniques are not a direct substitute for speech and communication. Gerber and Kraat (1992), for example, observed AAC users and found that their first linguistic productions are often simpler, shorter, and less varied than naturally spoken productions. In addition, the medium often dictates unique communication strategies and forms and productions that do not necessarily reflect the linguistic competencies of the child. Finally, partners assume atypical roles in caregiver-AAC user conversations.

When describing communicative interaction in AAC, Granlund, (1993) and Light (1989) consider communicative competence as being an important key concept. Communicative competence is defined by Light (1989), as the quality or state of being functionally adequate in daily communication, or of having sufficient knowledge, judgement and skill to communicate. Thus communicative competence is predicated on knowledge, judgement and skill in four areas: the linguistic, operational, social and strategic.

Light, (1989) further defines the linguistic competence as the individual's mastery of the linguistic code. It refers to the complexity of the expressions used to convey information and the modes used for the expression. Operational competence refers to the skills necessary to create communicative opportunities, while social competence is defined as the mastery of the social rules of communication. These include both sociolinguistic and sociorelational aspects. Sociolinguistic aspects involve communicative functions and discourse rules, whereas sociorelational aspects are related to responsiveness to partners, self-image and personality factors such as temperament and readability. Finally the author states that strategic competence is related to abilities to use compensatory strategies to overcome limitations in linguistic, operational and social competence, as demonstrated in the next figure.

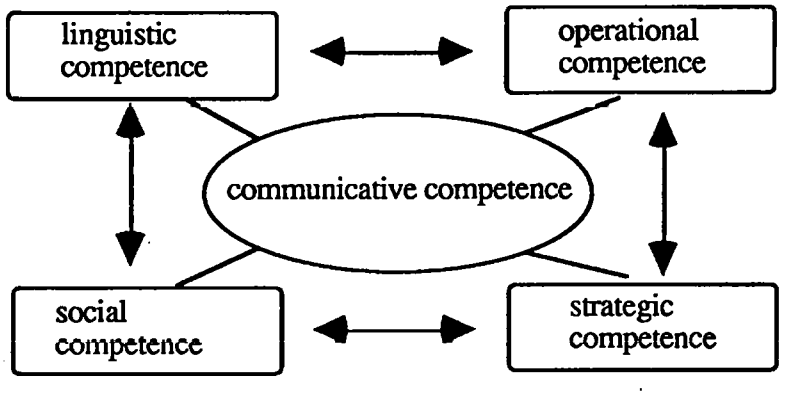


Figure 2.1: Model of communicative competence (Light, 1989).

Communicative competence may be seen as a global concept and has to do with "knowing" how to communicate. It may vary in degree (level of mastery), and is dependent on the partner, the situation encountered, and the mission.

It seems logical, therefore, that the overall communication development process may follow different courses for vocal and non vocal children. In the presence of such differences, there is a need to ask whether or not language development models based on children who naturally acquire spoken language, are relevant and useful for the child using AAC systems, particularly since these models are heavily weighted in linguistic production, an area that is particularly affected by the limited capabilities of many AAC users.

Some researchers have called for the creation of new communication models based on the unique characteristics of AAC users and their interactions (Gerber & Kraat, 1992; Kraat, 1985) while others argue that with minor modification, AAC fits within existing communication models (Lloyd & Blishchak, 1992)

Future research with children using AAC systems is needed, integrating both linguistic and pragmatic competencies, and leading to a broad picture of a child's communicative abilities.

2.4. Augmentative and Alternative Communication

"For a person with severe motor impairment who does not speak, communication, no matter how it is accomplished, is the key that unlocks the door... letting the individual OUT and the rest of the world IN. It is language that truly connects one human to another"

Blackstone, S. (1993)

As mentioned before, speech is the most common form of communication. However,

not everyone is able to speak, or to make speech easy to understand, no matter how much training they are given. For these individuals, Augmentative and Alternative Communication (AAC) aided or unaided, will be their main form of communication.

AAC users and potential users are a heterogeneous group of people of all ages, socio-economic, ethnic and racial backgrounds. In the case of individuals using aided communication, the only common trait is their need for adaptive assistance for speaking and/or writing (Beukelman & Mirenda, 1992). They have variously been called "AAC users", "augmentative communicators", "augmented communicators", "consumers", "nonspeakers", "nonspeaking individuals", "paravocal communicators" (Lloyd and Blischak, 1992). Once popular terms such as "nonoral", "nonvocal", and "nonverbal" have largely been abandoned, as they failed to adequately describe the skills of many severely speech impaired individuals who use vocalisation for communicative purposes (Zangari, Lloyd, & Vicker, 1994).

As early as 1973, McDonald and Schultz questioned the term "nonverbal" for the cerebral palsy children they were working with. They argued that these children understood words, they only lacked the ability to speak them. Subsequent terms such as "nonspeaking" "nonspeaker", also fell out of favour (Mirenda, 1991, Musselwhite, 1988; Lloyd & Blischak, 1992) in the face of criticisms like that of Lloyd & Blischack (1992) who argued that the term 'nonspeaker' is not only inaccurate but suggests that whatever speech exists is so inconsequential that it can be discounted.

Mirenda (1991), has expressed a preference for the terms "AAC users" or "augmented communicator". "AAC users" appears to represent AAC in the broadest sense, by not excluding those individuals who truly use an alternative to natural speech or writing. It encompasses both aided and unaided communication (see page 46) without regard to the extent to which an individual has received AAC intervention.

Augmentative communication refers to supplementary or supportive communication. The word "augmentative" emphasises the dual purpose of alternative communication

training: to promote and supplement speech and to guarantee an alternative form of communication if the individual does not begin to speak (von Tetzchner & Martinson, 1992). Alternative communication is used when the individual communicates in face-to-face communication in other ways than through speech. In both cases, individuals need to use a symbol set/system to communicate and the adequate assistive technology which make those systems accessible to their specific handicap

Research has shown that augmentative systems can benefit their users (Beukelman & Yorkston, 1977; Silverman, 1980) by increasing speech intelligibility, improving the ability to communicate, and increasing attempts at speech. Furthermore, some augmentative systems, particularly aided systems, may help the user to organise language output through their explicit visual content (Shane, 1981). A historical presentation of the field of Augmentative and Alternative communication (AAC) follows.

2.4.1. Historical Perspective

An historic perspective of the field of Augmentative and Alternative Communication has been authoritatively given in a recent review paper by Zangari, Lloyd and Vicker (1994). In this interesting work, the authors refer to the development of AAC at an international level, relating several factors such as the advances in medicine, education, technology, etc. What follows in this sub-chapter has been fundamentally based on their publication.

Although the modern field known as AAC emerged in the late 1950s and 1960s people have used some nonspeech methods of communication for thousands of years. Anthropologists maintain that gestures and vocalisations were used by our prehistoric ancestors long before they developed the capacity to express complex linguistic structures through speech. In the more recent past, the first one-handed manual

alphabet by individuals with hearing impairments was recorded by Italians in 1579 (cited in Savage, Evans & Savage, 1981).

By the middle of this century professionals began to feel the need for innovative alternatives in communication for those who were unable to meet their daily communication needs through natural modes such as speech, gestures, or handwriting and the modern age of AAC began. Attention to AAC has increased as both the general population and that of people with disabilities has grown. Advances in medical technology and pharmacology which have resulted in more children with disabilities surviving the neonatal, infancy, and early childhood periods, have also increased the number of potential AAC users. The decade of the 1950s may be considered as the beginning of AAC methods and practice among clinical/educational professionals. In the early years, research with new clinical approaches was infrequent. It is only recently that a body of published AAC literature has been compiled. In the field's first decade, however, work began and in the educational sector unaided communication strategies received increased attention.

During the 1960s AAC became a new multidisciplinary field supported by social changes, technological advances, shifts in educational thinking, and insights from research in related areas. The reality of an increased number of people with disabilities expanded the public attention to this population. For example, in the UK, the need to provide educational rather than just care services to persons then categorised as having mental retardation, was emphasised. Also in this country, communication aids for individuals with cerebral palsy were developed (such as the POSSUM by Maling and Clarkson in 1963) and represented an enormous advance for individuals with severe speech and physical impairments.

In the early 1970s a number of socio-political factors influenced the AAC movement. The "disability rights movement" provoked changing attitudes toward individuals with disabilities, contributing to the development of AAC (Hoolihan, 1984, 1985; Savage

et al. 1981). Communication came to be seen as a fundamental right of every individual and graphic symbols began to be required in communication intervention programs to augment previously acquired skills (Silverman, McNaughton, & Kates, 1978)

The first serious impact of basic research on AAC began during this period. Research into the use of nonspeech symbols with nonhuman primates was a particularly interesting example, as studies demonstrated how chimpanzees could be taught to use manual signs and other abstract symbols in a communicative fashion (Gardner, 1968; Gardner & Gardner, 1979; Premack, 1971; Premack & Premack, 1974; Rumbaugh, Gill & von Glasserfield, 1973). Mayberry (1976), explains how this research enlarged professionals' perspective of language, language acquisition and communicative symbol learning, which in turn stimulated increased interest in other possible applications. For instance, it was following the non-human primate studies that clinically oriented professionals began to provide similar AAC symbol training to severely communication impaired individuals: those with cognitive impairments (Carrier, 1974; Deich & Hodges, 1977); with cerebral palsy (Dixon & Curry, 1973; Gertenrich, 1966; Goldberg & Fenton, 1960; Kavanaugh Holmlund, & Krause, 1966; Lorrett, 1969); and adults with neurological disorders (Adams, 1966; Chen, 1968; Eagleson, Vaughn, & Knudson, 1970).

It was also during the 1970s that AAC began to emerge as a legitimate area of specialisation within many professions encouraged by theoretical insights into language development concerning pragmatics, semantic, and communicative intent (Bates, 1976; Bloom, 1970) which focused on the function of communicative acts, rather than the form.

This period saw the development of the Makaton Vocabulary of signs and symbols which was developed in the UK for adults with hearing and cognitive impairments living in institutional settings (Walker, 1973; Cornforth, Johnston, & Walker,

1974); its popularity continued into the 1990s (Grove & Walker, 1990). Blissymbols appeared as well as part of the innovative intervention implemented at the Ontario Crippled Children's Centre to communicate with children with cerebral palsy who were unable to use traditional orthography effectively (Kates & McNaugthon, 1975; McNaugthon, 1976). The application and development of Blissymbolics, led to a better understanding of the role of speech in young children's learning and of the ways alternatives to speech could contribute to an individual's development (McNaughton, 1990).

Other important developments included the popularisation of microcomputers and interfaces as well as the professionalization of systemic research and publication in refereed journals.

In the 1980's the field's gains were consolidated. Professional societies (e.g. ISAAC) arose and publications flourished. Governments in countries such as Canada, Sweden and the United Kingdom began to support AAC services for individuals with severe communication impairments.

Theoretical, research and intervention interests became more sensitive to the complexities of social interaction. Classic works of the period include the "AAC Taxonomy" proposed by Lloyd and Fuller (1986), a rethinking of "communicative competence in AAC users", proposed by Light (1988), and a proposed "communication model" by Lloyd, Quist, & Windsor (1990).

After the impressive gains of the 1980's, the early 1990s were marked by a commitment to increasing the independence of individuals with disabilities and their involvement in the mainstream of society. In the educational system, greater numbers of children with special needs began to be integrated, with varying levels of support, into regular education classes. The rights of pupils with learning disabilities to an inclusive education has since then been defended (Carpenter, 1994, 1995).

Topics of research during the period include:

- issues of competence (Bedrosian, et. al., 1992; Kangas, 1991)
- vocabulary selection (Baker,et. al., 1991; Beukelman, McGinnis, & Morrow, 1991)
- communicative functions (Glennen, 1991)
- individual language learning styles (Iacono, 1992)
- motor requirements for manual signs (McEwen & Lloyd, 1990)
- speech intelligibility between natural speech and speech synthesis (Mirenda & Beukelman, 1990)
- simultaneous communication and speech comprehension (Remington & Clark, 1993a, b)
- methodologies and issues in AAC research (Brodin & Bjorck-Akesson, 1990)
- service delivery models (Phillips & McCullough, 1990; Tindal, Shinn, & Rodden-Nord 1990; Bruno & Sauer, 1992)
- integration of AAC instruction into regular educational classrooms settings (Mirenda, 1992; Calculator and Jorgensen, 1991; Light, et. al., 1992)
- efficacy of AAC strategies, symbols, devices, and programs (Blackstone, Carter, Berg & Biondi, 1992; Kostraba,et.al., 1992; Norris, Parnes, Boschen & Schuller, 1992; Poock, Blackstone & Berg, 1992; Raghavendra, Rosengren & Hunnicut, 1992)

Another area of increased interest was in the area of teaching literacy to student-AAC users. The development of a research group in the Carolina Literacy Center greatly contributed to the increased interest in literacy (Coleman & Steelman, 1992; Koppenhaver, 1991; Koppenhaver, Evans & Yoder, 1991; Koppenhaver & Yoder, 1992, 1993; Light & Binger, 1992).

The 1990s also brought a change to the client population. Initially, AAC was used with individuals with little or no functional speech, due to congenital conditions such as cerebral palsy or mental disabilities and to individuals with laryngectomy.

More recently there has been an increase in the services provided to persons with severe speech impairments resulting from acquired disorders: amyotrophic lateral sclerosis, Guillain-Barré syndrome, multiple sclerosis, Parkinson's disease, brainstem stroke, respiratory insufficiency, spinal cord injury, head injury, and aphasia.

Considering the broad, transdisciplinary nature of AAC, it is surprising that the development of this field has been so incredibly rapid. Zangari, Lloyd & Vicker (1994) express the hope that "by reviewing the course of development and understanding the trends and directions the field has taken, professionals will be able to make clearer, more informed decisions regarding theory, research, and service delivery as we progress through the 1990s and into the 21st century".

2.4.2. Communication Symbol Systems

Communication is an interactive process, involving many different behaviour modes in simultaneous exchange of information using socially accepted means. Those behaviours can be, according to Beukelman & Mirenda (1992), verbal and nonverbal, whether they have a linguistic base or not.

In a "normal" model of communication, Beukelman & Mirenda (1992) suggested that those behaviours mainly consist in eye contact, body language, facial expression, natural gestures, conventional gestures, vocalisation, speech and writing/drawing. People normally conduct these interactions using speech as their primary mode of communication. Nonverbal behaviour includes gestures, vocalisations and other paralinguistic elements and, as stated by Knapp (1980), they can contradict, substitute, complement, accent, or regulate verbal behaviours.

While all of these are important elements of communication, gestures and vocalisations are perhaps the most extensive forms of nonverbal behaviours. Gestural behaviours

includes fine and gross motor body movements, facial expressions, eye behaviours, and postures. Vocalisations are often exhibited with a communicative purpose by people who have difficulty with speech. They may range from involuntary sounds such as sneezing or coughing, to voluntary vocalisations such as crying or laughing.

According to Vanderheiden & Lloyd (1986), a symbol system refers to a set of symbols specially designed to work together to allow for maximum communication. Symbols, used to represent objects, actions, relationships, etc., can be spoken, graphic, or manual. While spoken symbols are conveyed through the auditory-vocal senses graphic and manual symbols are conveyed through the visual senses (Fristoe & Lloyd, 1979). Basically, a symbol is "something that stands for, or represents something else" (Vanderheiden & Yoder, 1986). The "something else" that a symbol represents is called its referent.

A wide variety of aided symbol systems can be used for Augmentative and Alternative Communication. In this case, one of the interaction partners relies primarily on other modes of communication, different from speech. Those modes can be considered as Aided or Unaided, according to the different forms of augmentative communication used.

A number of definitions and taxonomies have been used to describe symbols and their various forms (see Lloyd & Fuller, 1986). These authors propose the development of a symbol taxonomy using the "aided and unaided" dichotomy as the superordinate level of classification. According to them:

"Aided symbol systems" refer to those systems composed of symbols that require some type of external assistance, either an aid or device (paper, pencil, pictures, charts, communication boards, and in some cases electronic devices) for production (Lloyd & Fuller, 1986). Most but not all aided symbols may be referred to as graphic. Aided symbols are frequently enduring and are relatively fixed or permanent (remain available in the same form) and therefore most of them may be thought of as static.

"Unaided symbol systems" refer to those systems composed of symbols that do not require any aids or devices for production (Lloyd & Fuller, 1986). Unaided symbols require only the sender's face, head, hands, arms, and other parts of the body, and are frequently referred to as manual, although speech is included in this category. Unaided symbols are typically nonenduring and frequently involve movement or change. In many instances, the movement or change (including durational, temporal, and transitional factors) carries much of the meaning, and therefore most of the unaided symbols may be thought of as dynamic.

A number of unaided communication systems have been designed especially to serve the needs of deaf individuals. Examples of those unaided systems are Signed English, Cued Speech and Amer-Ind. By contrast sign languages which are also unaided systems, have evolved naturally.

In addition, there are some symbol sets that incorporate manual signs with graphic symbols and they are considered to be "Combined Symbol systems". Three combined symbol systems that have been used in augmentative communication are Visual Phonics, Sigsymbols (Cregan, 1982), and Makaton Vocabulary (Grove & Walker, 1990).

In the UK, the Makaton Vocabulary is one of the most widely used systems (Kiernan, Reid & Jones, 1982; Reid, Jones & Kiernan, 1983). It combines speech, manual signs, and graphic symbols. The core vocabulary consists of approximately 350 concepts organised in a series of nine stages. The Makaton approach has been used successfully with children and adults with severe learning disabilities, autism, specific language disorders, multiple sensory impairments, and acquired neurological problems affecting communication (Walker, 1987; Carpenter, 1987a).

2.4.3. Aided Symbol Systems

According to Musselwhite and St.Louis (1988), and Beukelman and Mirenda (1992),

aided symbol systems can be divided into four major categories:

1. Tangible/Object Communication Systems

Tangible symbols are typically used with individuals with visual or dual sensory impairments and severe intellectual disabilities. The four types of tangible symbols are:

a) Real object symbols which may be identical to, similar to, or associated with their referents. It appears that many persons with intellectual disabilities are able to match identical and nonidentical (i.e., similar) object symbols with similar accuracy (Mirenda & Locke, 1989). This suggests that both types of object symbols may be equal in enabling recognition of their referent (Park, 1995); however, it is important to be cautious in this assumption, especially with beginning communicators.

b) Miniature objects may be more practical than real object symbols in some situations but need to be selected carefully to maximise effectiveness (Vanderheiden & Lloyd, 1986).

c) Partial objects may be useful in some situations, particularly when involving referents that are large. For example, the top of the spray bottle of the window cleaner may be used to represent "washing the windows" at a vocational site.

d) Artificially Associated and Textured Symbols may also be constructed by selecting shapes and textures that can be artificially associated with a referent. Textured symbols are a subtype of this category, and these may be either logically or arbitrarily associated with their referents.

2. Representational Symbol Systems

The majority of aided symbol systems used by AAC users falls in the category of representational systems, meaning that most symbols used in the system suggest their referents. This connection may be directly suggested, as in the case of a pictograph (e.g. a drawing of a tree that clearly depicts the trunk, limbs, and leaves) or an ideograph (e.g., a symbol that evokes an idea of the referent, such as a happy face to

denote the concept happy).

Many types of two-dimensional symbols can be used to represent various concepts. These representational symbols include pictures, photographs and line drawings, which can be either commercially available, or constructed from commonly available materials :

a) Pictures and photographs may be used to represent objects, verbs, people, places, and activities.
b) Line drawings are usually symbols mostly commonly used by AAC users, and they are typically referred to as graphic symbols. Some of the most commonly cited systems include: Pictogram Ideogram Communication (PIC), Touch'n Talk, Okland Picture Dictionary, PICSYMS, Picture Communication Symbols (PCS), Rebus, and Blissymbols.

3. Abstract Symbol Systems.

For these systems, the meaning is not suggested by the symbol's' appearance. The two most widely known and used abstract symbol sets are Yerkish lexigrams used in a nonhuman primate language research project "Lana", and Non-Slip symbols based on Premack's work with chimpanzees (Premack, 1971).

4. Symbolic Language Codes.

These consist of codes representing the letters or sounds of a language such as English or Portuguese. Examples are alphabets, phonemes, words, alphabetic clusters, Braille, and Morse Code.

Traditional orthography refers to the written characters used to transcribe a particular linguistic system. Orthography has been used in AAC systems in the form of single letters, words, syllables, sequences of commonly combined letters, and phrases or sentences (Beukelman, Yorkston, & Dowden, 1985; Goodenough-Trepagnier, Tarry,

& Prather, 1982).

Of all the symbol characteristics investigated to date, iconicity is the one variable that applies across both the aided and unaided domains.

2.4.4. Iconicity

Fuller, Lloyd & Schlosser (1992) in their last revision of Symbol Taxonomy, define the term iconicity as referring to the continuum that describes symbols by ease of recognition. At one end of this continuum are "transparent symbols", which visually resemble their referents, and, thus, are high in guessability; at the other end are "opaque symbols", whose visual relationship to their referents is not obvious and may be quite arbitrary. As an example, a colour photograph of a car is transparent, while the written word "car" is opaque. In the middle of the iconicity continuum are "translucent symbols", which are not readily guessable without additional information (Reichle, York, & Sigafoos, 1991). Translucent symbols are often described in terms of their learnability.

Several studies have indicated that learning is related to the variable of iconicity. Since there is a direct relationship between the two, this classification could prove to be very useful for clinicians and educators working with AAC users. The major representational symbol types are reviewed in this study in terms of their relative guessability (transparency) and learnability (translucency), ranging from concrete to abstract. A decision as to whether a set/system is iconic or opaque largely depends on the current knowledge based on research. There is a limited research base on iconicity at the individual symbol and at the system/set level for most AAC symbols.

Three research studies (Mirenda & Locke, 1989; Mizuko, 1987; Mizuko & Reichle, 1989) indicated that both PCS and Picsyms are more transparent than Blissymbols, for nonhandicapped preschoolers and for school-age and adult individuals with intellectual

Three research studies (Mirenda & Locke, 1989; Mizuko, 1987; Mizuko & Reichle, 1989) indicated that both PCS and Picsyms are more transparent than Blissymbols, for nonhandicapped preschoolers and for school-age and adult individuals with intellectual disabilities. In a comparative study of Blissymbols, PCS, PIC, Picsyms, and Rebus symbols, PCS and Rebus were found to be the most translucent across nouns, verbs, and modifiers (Bloomberg, Karlan, & Lloyd, 1990). In general, the translucency data indicates that nonhandicapped preschoolers learned more PCS symbols over three trials than either Picsyms or Blissymbols (Mizuko, 1987) while adults with intellectual disabilities appeared to find PCS and Picsyms equally learnable (Mizuko & Reichle, 1989).

Reichle et al. (1991) and Vanderheiden and Lloyd (1986) summarised a number of studies that indicate that white-on-black pictures are not necessarily more visually salient than standard black-on-white drawings. In a study with nonhandicapped adult subjects, PIC symbols were found to be less translucent than PCS and Rebus symbols but more translucent than Blissymbols (Bloomberg et al., 1990).

Leonhart and Maharaj (1979) reported that adults with severe/profound intellectual disabilities learned PIC symbols faster than Blissymbols. PIC symbols have been used with persons with severe/profound disabilities (Leonhart & Maharaja, 1979; Reichle & Yoder, 1985) and with persons with autism (Reichle & Brown, 1986).

Numerous studies have indicated that of all of the representational symbols in common use, Blissymbols are the least transparent, most difficult to learn, and the hardest to retain (Bloomberg et al. 1990; Hurlbut, Iwata, & Green, 1982; Mirenda & Locke, 1989; Mizuko, 1987; Burroughs, J. A., 1986; Forbus, S. S., 1987; Goossens', C. A., 1983).

2.4.5. Graphic Representational Systems: PIC, Bliss, and PCS

Over one dozen graphic representational symbol systems are currently in use (McNaughton, 1990). Not all graphic symbol systems are equal with regard to the internal structure of the symbol, or in the manner in which meaning is conveyed through presentation of more than one symbol. Different systems require different cognitive skills on the part of the learner due to their unique organisations. As no two individuals are ever alike, it is necessary for the instructor to have knowledge of the learning capabilities of the potential student, as well as an understanding of the characteristics, strengths and weaknesses of the system, in order to match the student with the system properly (Silverman, McNaughton, & Kates, 1978).

Depending on what country you live in, some graphic systems are more common than others. The following is a description of the three systems (PIC, PCS and Blissymbolics) which have been translated and adapted into the Portuguese language, and are, therefore, used in Portugal. The graphic representational symbol system used in the study, the Picture Communication Symbols (PCS), is presented in more detail.

2.4.5.1. PIC (Pictogram Ideogram Communication)

PIC (Pictogram Ideogram Communication) originated in Canada, where it was developed by Subhas Maharaj, a speech therapist, in 1980. It was translated and adapted into Portuguese in 1986, based on the Canadian and Swedish versions of the system .

PIC symbols differ from most other symbol sets since, in an effort to increase their visual saliency, they are depicted as white symbols on black background. Although the saliency advantage of white on black drawings seems logical, the limited data available are, according to Vanderheiden & Lloyd (1986), equivocal.

The PIC system consists of stylised drawings which form white silhouettes on a black background composing the 800 symbols that are part of this set. The word is always

written in white lettering above the drawing. The system has become popular especially in Scandanavian countries, in some cases used as an alternative to Blissymbols among those with extensive learning difficulties. However, it is difficult to draw and it can become too expensive to xerox, because of the black background.

PIC symbols are less versatile, and, in some respects, more limited than Blissymbols. Also, it is not easy to combine them to form new words or sentences, which makes it a very limited communication system.

2.4.5.2. Blissymbols

Blissymbols are among the most sophisticated pictographic language systems. Created by Charles Bliss over a period of more than 20 years, it was originally conceived of as a graphic visual language that could be used by people who spoke different languages (Bliss, 1965). Considered as an international written language, with Chinese as a model, the aim was to promote peace by enabling statesmen from different countries to communicate more easily with one another (Bliss, 1965).

A number of factors led to the development of the system: first, as Charles Bliss was born near the Russian border of Austria, he was exposed to the misunderstandings created by different languages (Bliss & McNaughton, 1975); as a young man, he was also introduced to the logical languages expressed in chemical and mathematical symbols, through his training as a chemical engineer. The idea for the Blissymbolic system was finally conceived while Bliss was in China, where he attempted to read Chinese ideographic writing. The system he developed was termed "Semantography", extensively described in the book *Semantography* (Bliss, 1965).

In the early 1970s Blissymbolics began to be used in Canada at the Ontario Crippled Children's Center, as a system of writing for physically disabled children who were unable to speak, and who also had difficulty in learning to read and write

(McNaughton and Kates, 1974).

Blissymbolics is a logical, visual-graphic system using symbols formed from a small number of basic components. It is primarily a semantically based system formed from a number of 100 basic shapes, some of which are geometric, which can be combined to create thousands of vocabulary items.

Blissymbols were designed to represent concrete and abstract symbol concepts using consistent linguistic rules. The symbols are not as immediately transparent as symbols from other pictographic languages, however, and according to Vanderheiden & Lloyd (1986), once the linguistic patterns of Bliss are learned, the system allows greater flexibility for communication than other pictographic systems.

According to McNaughton (1985), Blissymbols can be simple or compound, and can be divided into four classes (pictographs, ideographs, mixed, and arbitrary). Strategy symbols may be used to change or create new symbol meanings. These include symbols such as opposite meaning, part of, and intensity, which change the meaning of a symbol in a specific way.

The semantic base of Blissymbolics allows a small number of symbol elements to be combined into a large number of entries. The pictographic and ideographic nature of many of the symbols allows them to be easily learned and retained. This makes the system ideal for individuals who are not ready for traditional orthography alone, but who have the potential to learn large vocabularies.

Musselwhite & St. Louis (1988) reported that Blissymbolics was being explored as an educational tool for blind, deaf, and autistic students; for pre-reading activities; for remedial reading programs; for visual-perception remediation; for second language teaching; for concept and language development; as an enrichment activity; and for communicating with students with severe behavioural and emotional problems. Blissymbolics have reportedly been used with success by symbol users having a wide

range of disabilities, including physical disabilities (Kates & McNaughton, 1975; Nunes da Ponte, 1989) mild to severe developmental delay (Harris-Vanderheiden, 1976; Song, 1979), multiple handicaps (Elder & Bergman, 1978); deafness (Goddard, 1977), and adult aphasia (Saya, 1979).

According to Musselwhite & St. Louis (1988), the following skills are typically necessary for successful acquisition of Blissymbolics:

- Good visual discrimination skills, in order to distinguish small differences in features such as size, configuration, and orientation of symbols.
- Cognitive skills at the late preoperations or early concrete operations stage (Chapman & Miller, 1980).
- Moderate to good auditory comprehension and visual matching skills appear to be necessary for use with people having aphasia (Saya, 1979); these criteria may also apply to other populations.

2.4.5.3. PCS (*Picture Communication Symbols*)

The Picture Communication Symbols is one of the most frequently used communication systems for both clinical and research applications. The original set of Picture Communication Symbols (PCS) was developed by Roxana Mayer Johnson in 1980 for use on AAC aids and contained 700 different picture symbols. Two additional books of symbols (PCS Books II and III) have since been added. In 1995 the PCS Combination Book was released, combining a total of 3,200 of the symbols from the three previous books. The system is also available on computer programs, and is translated into 9 different languages, including Portuguese. The author of this thesis was responsible for the translation and adaptation into the Portuguese language, of the PCS system in 1995.

The following description of this system is mainly based on the guide published by

Johnson R. M., (1995). Picture Communication Symbols (PCS) was designed because the author felt the need for a system that could be easily learned, either because of limited cognitive abilities in her students, or because the symbols would be needed for only a short period of time. Thus, PCS was developed as a versatile, relatively inexpensive picture set offering a large vocabulary of clearly presented drawings. Symbols are drawn with bold strokes, with the word written above, and comprise primarily simple and clear drawings. The set is basically nongenerative (Whitley, 1985), as no rules exist for developing new symbols.

It is appropriate for use by persons of all age levels, with a variety of impairments, including mental retardation, cerebral palsy, autism, head injuries, oral apraxia, neuromotor diseases, and respiration problems. It may support either a temporary or permanent communication need, or may be used as a supplementary communication system. The PCS is appropriate for persons for whom a simple level of expressive language is acceptable. Typically this involves a limited vocabulary and moderately short sentence structures. Although the system has been drawn with visual impairments in mind, many visual problems will still make it difficult to see or differentiate between the symbols.

The Picture Communication Symbols (PCS) are primarily comprised of simple line drawings. The word each drawing symbolises is printed above the drawing. Symbols can be used as needed in conjunction with other photos, drawings, or symbol sets.

The PCS have been divided into six primary categories based on the function of each word. The symbols are often grouped by categories on communication aids to encourage proper sentence order, and they are as follows:

Social -- commonly used words in social interactions. They include socially "polite" words, apologetic words, slang expressions for delight and disgust, and any other words and expressions unique to the individual

People -- including personal pronouns

Verbs -- actions

Descriptive -- primarily adjectives and adverbs

Nouns -- those not included in other categories. Food and Leisure are grouped separately in some books but are still considered nouns.

Miscellaneous -- primarily articles, conjunctions, prepositions, time concepts, colours, the alphabet, numbers, and other miscellaneous abstract words.

The Picture Communication Symbols are line drawings and may be coloured in as desired. Whatever colour system is chosen should be used consistently. Colour then provides another cue as to symbol meaning and location on a display. Ideally the colour system would be the same throughout a school or program, as well as the different programs the AAC user might attend. The six word categories in the PCS may be used for a colour-coding system. The colour recommendation for each category of symbols, is based on the Fitzgerald key colour-coding system used with Blissymbolics:

People-Yellow; Verbs-Green; Descriptive-Blue; Nouns-Orange; Social-Pink; Miscellaneous-White.

The PCS can be customised whenever helpful. Therefore, the facilitator can feel free to adapt each symbol as needed. Customising may be done by hand or on the computer. If using a computer, customised symbols may then be stored in the Boardmaker program for later use. In addition, parts of symbols may be added or deleted as necessary. For instance, a beard, a brand name, or stripes on clothing could be added. Parts can be taken from two different symbols and combined into one. Thicker symbol lines may be beneficial for visually impaired individuals. The words above the symbols can also be changed when helpful.

From this section one may conclude that research has been focusing primarily on the use of graphic representational symbols for communication. Sevcik, Romski, and

Wilkinson (1991), studied the role of symbols in providing an insight into how ACC users perceive and construct their worlds. Schlosser (1993), added an examination of the formation of concepts by persons using graphic symbols to communicate.

Preliminary investigations have begun into the possible role of graphic symbol use in facilitating the development of literacy, and reading in particular, of this population. Researchers such as Cregan & Lloyd (1988); McNaughton (1993); Silverman, (1980), have investigated the relationship, in child users of graphic representational symbols for communication, between the use of graphic representational symbols during the preschool years and the child's ultimate reading acquisition.

2.5. Literacy

"Forever in a State run Institution.
No escape. My every move controlled by other.
Leisure time?
Plenty of that, but with nothing to do.
Forever the same. Year after year
Nothing to do. . . Forever.
I awake, surrounded by the familiar things of life,
Saved by high octane literacy.
I am here with you,
Empowered by the written word"

Michael Williams (AAC user)
("Alliance 95: Outcomes in AAC")

Literacy is an umbrella term referring to both the ability to read and the ability to write. Reading and writing are constructive processes and both are also interactive processes (Koppenhaver, Coleman, Steelman & Yoder (1994). Literacy depends on a good integration of subskills (e.g. spelling, word identification, personal interest,

Children are continually fine-tuning their understanding of the forms, use and content of printed language. Literacy begins to emerge in infancy as children learn important characteristics of print (e.g. books are held upright, pages are turned front to back), uses of print (e.g. making a wish-list for Santa, obtaining personal intimate attention from parents) and metalanguage (e.g., book, word, page).

2.5.1. Theoretical Perspectives

Just as spoken language develops in children from the time they are babies, as they listen to and interact with their parents, literacy is also developing. This happens as they are read to, as they watch people scribbling with a pencil on paper, and as they ask questions about letters and words, and observe their parents engage in reading and writing during the normal course of the day.

The following definition attempts to unite current theoretical views about literacy: it is the process by which people learn to interpret meaning encoded in print and translate meaning into text. This process emerges (in a manner similar to that of spoken speech) in real-life situations as a result of social interaction as children observe reading and writing, and the mediating cognition used to accomplish goals (Anderson & Pearson, 1984; Shanahan & Lomax, 1986; Teale, 1987; Blackstone, 1989; Koppenhaver, Pierce, Steelman, Yoder, 1993)

Literacy acquisition is a social process in several different aspects (Sulzby, Teale, & Kamberelis, 1989; Koppenhaver, Steelman, Pierce, Yoder, Staples, 1993; Shanahan & Lomax, 1986). First, it is acquired in social interaction such as parent-child story book reading and other experiences which, in Vygotsky's words, are ultimately internalised as the capacity for reading and writing (1978). But literacy is also social to the extent that it is "used to establish structure, and maintain social relationships between and among people". (Bloom & Green, 1984). Finally, the actual skills of

reading and writing involve interaction between authors and readers (Blackstone 1989).

Reading and writing, however, are no longer seen as the only two literacy skills. Current theoretical attention also has focused on the thinking skills involved in the construction of meaning (Blackstone, 1989). Furthermore, whether constructing meaning in either the interpretative (reading) or expressive (writing) processes, readers utilise their understandings of the world and their command of a range of written and oral language skills (Anderson & Pearson, 1984; Hayes & Flower, 1980). Finally, Paris, Wasik, & Turner (1991), maintain that both reading and writing require strategic skills in order for readers and writers to monitor their comprehension or composition processes and select tactics or strategies appropriate to a variety of texts, purposes, and occasions.

It is interesting to note that empirical evidence exists suggesting that the acquisition of reading and writing are mutually reinforcing as individuals use what they learn about reading to improve their writing (reading comprehension can aid revision) and vice versa (spelling skills can aid word identification) (Shanahan & Lomax, 1986).

As far as sequencing is concerned, reading and writing acquisition was traditionally seen as following language development. However, Burckhart (1993) cites research suggesting that, in fact, language and literacy develop in a more parallel fashion.

People can be considered literate when they have acquired the knowledge and skills necessary to engage in all those literate activities required for effective functioning in their group or community (Oxenham, 1980). It is, perhaps in this sense, that literacy development has been conceptualised as the acquisition of culture (Teale, 1987).

2.5.2. The Importance of Literacy

Literacy is a vital skill for all members of society. Jackson, (1993) reminds us that it is much more than the "simple" acts of reading and writing; it involves notions of power, of culture and community and of social learning, making up part of the social heritage of any community. Another advantage of literacy is that it functions, together with other communication abilities, in a mutually reinforcing way so that literacy gains promote increases in all other language skills and vice versa, as illustrated in the following model, by Koppenhaver, Coleman, Kalman & Yoder (1991).

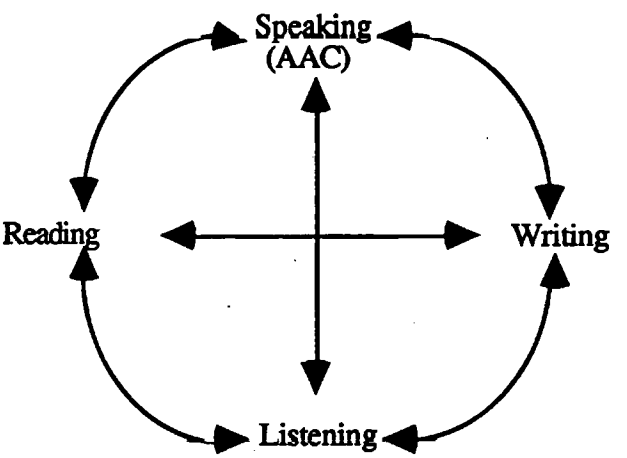


Figure 2.2: Model of Oral and Written Language Development Koppenhaver, Coleman, Kalman & Yoder, 1992

Literacy is important to all members of society but it is especially critical to AAC users (Yoder & Kraat, 1983). In fact, Blackstone, (1989), argues that "...more than any other skill, literacy is considered critical to people who cannot speak; without literacy, use of language is restricted, and a range of living options, such as daily living activities, educational and vocational opportunities, remain out of reach".

Literacy is the tool which allows people with SSPI to express their unique personalities, to learn, to grow, and to create. It increases one's own self-respect and the respect of others. The ability to communicate through verbal and written language helps children with SSPI, to be enabled rather than disabled and to live independent and productive lives. Thus teaching literacy could be defined as "empowerment".

However, the very limitations which make literacy so empowering for children with SSPI make their task of learning to read and write different and much more difficult (Jackson, 1993).

Together with the professionals mentioned above, Greer (1991) argues that the ability to read and write is even more important for persons with disabilities than for their non-disabled peers because of the added communication power these abilities can lend to a person with disabilities. Research, however, indicates that learning to read and write in this population is often the exception rather than the rule. For example, McLean, et. al., (1991), point out that children with learning difficulties are generally at risk of lesser educational achievement in all areas, while their risk for greater literacy difficulties has also been identified (Koppenhaver, Coleman, Kalman, & Yoder, 1991).

In the case of AAC users, severe literacy-learning difficulties have been recorded (Center & Ward, 1984; Danilova, 1983), some of which continued into adulthood (Kelford Smith et al., 1989). In fact, in their review of the literature Koppenhaver, & Yoder (1992) found that as many as 70 to 90% of AAC users had such severe problems and that they ranked significantly behind their peers in this area. Finally, even when achieving literacy, many AAC users demonstrate difficulties with written communication. Kelford-Smith, Thurston, Light, Parnes, & O'Keefe, (1989), for example, analysed writing samples of these young people and consistently found incorrect usage of grammatical forms and errors in spelling performance .

Nevertheless it is clear that individuals with SSPI have the linguistic and cognitive skills to achieve conventional literacy (Berninger & Gans, 1986; Foley, 1989). Furthermore, Koppenhaver (1992), cites a large and growing body of research suggesting the efficacy of early intervention in the lives of individuals with disabilities. In fact, evidence exists from several studies suggesting that early training is very important; specifically, early success, or failure, in reading has been found to be

highly predictive of continued similar performance throughout the upper elementary grades and secondary school (Clay, 1979; Juel, 1988; Lundberg, 1984).

The following section reviews empirical studies identifying contributions and barriers to literacy learning among people with SSPI.

2.5.3. Recent Advances in Literacy Learning Research of AAC Users

Teaching literacy to AAC users is becoming an area of great significance for people working in the field (Yoder & Koppenhaver, 1993). Research, although very recent, has been increasing since 1990. The substantial contribution of the research group at the Carolina Literacy Center has already been mentioned. This section outlines some of the results of this surge in research as it lists both barriers and stimuli to literacy learning that have come recently come to light.

For example, Koppenhaver & Yoder (1990a) analysed barriers to the development of literacy among individuals with SSPI and found them to be widespread, profound and persistent. They cite three types of barriers:

- personal barriers, related to neuromotor limitations, cognitive differences, and communication competencies.
- environmental barriers referred to information deficits, education system deficits, and limitations on opportunities for interaction.
- technological barriers concerned with AAC systems and techniques and the lack of professional expertise.

An example of an educational system barrier was identified by Erickson, Koppenhaver, & Yoder, (1994a). They argue that adult AAC users came up against a medical model of disability which views them as sick or in need of some kind of services to make them better. Similarly, in educational programs focusing on literacy, it was commonly thought that individuals should first firm establish oral language and

speaking skills before literacy instruction and literacy learning could occur. Thus, individuals that could not speak could not learn to read and write. Researchers working within this model attributed literacy learning difficulties experienced by persons with SSPI to the individual's impairments (Barsch & Rudell, 1962; Batshaw & Perret, 1981; Schonell, 1956).

The most important successful stimuli to literacy learning among children with SSPI include literacy-related opportunities (Coleman, 1991; Koppenhaver, 1991; Mike, 1987; Koppenhaver, Evans, & Yoder, 1991; Light, Kelford Smith & McNaughton, 1990). Furthermore, Steelman et al. (1992) report that positive attitudes about the importance of literacy for children, coupled with positive expectations about children's abilities (on the part of parents, teachers and support personnel), were reflected in a greater number of literacy-related experiences than was the case for children who were perceived as not having the potential to learn to read and write.

Much research, however, suggests that children with SSPI generally have limited opportunities to learn. Studies of Koppenhaver, Coleman, Steelman, & Yoder (1994) suggest that those children have limited access to writing materials and experiences either at home or school; they have few opportunities to interact with others during literacy activities at home or school; and instead of having opportunities to read or write texts at school, they were only engaged on individual word drill (Koppenhaver, Evans, & Yoder, 1991; Koppenhaver, 1991; Light, Kelford Smith, & McNaughton, 1990; Mike, 1987; Wasson & Keeler, 1984).

Studies of successful literacy learners among AAC-using children with SSPI who learn to read at the same time as their normal speaking peers indicate that they tend to be active users of their communication aids as pre-schoolers and show an active interest in text. Furthermore, they need considerable support to enable them to participate fully in the "regular curriculum" along with their able-bodied peers (Blackstone, 1989).

After a review of available research on the literacy learning characteristics of persons with SSPI, Koppenhaver, & Yoder (1988), found positive correlations between reading achievement and self-esteem, literate home and school environment, parental and teacher support and advocacy, and the number of decoding strategies individuals have developed; moderate correlation between intelligence and reading achievement; no correlation between disordered eye movements and reading achievement. Physical and speech impairments were negatively correlated with achievement.

In conclusion, the findings presented above, as suggested by Steelman, et. al., (1993) point toward the importance of promoting proactive attitudes and including print-related activities early in instructional programming for young children with severe communication impairments.

Meanwhile, Koppenhaver et. al., (1992) have outlined useful guidelines for future research in the area of literacy studies for children with SSPI. Effectiveness of reading and writing are necessary as well as detailed procedures to permit the replication of individual research projects. They also call for a more comprehensive model of literacy while investigating the relationship of various parameters of AAC to literacy.

2.5.4. The Literacy Learning Environment

The role of context and complex knowledge processes profoundly influences not only the development of cognitive potential but also performance at any stage. Performance on a specific type of reading task will depend critically on the total background and developmental experiences of the child as well as on the specific characteristics of the situation in which the reading task is undertaken.

Reading and writing are skills. Skills have to be practised, and they improve through successful interaction with literate others. Blackstone (1989), argues that an understanding of literacy development must consider not only the child's cognitive

processes for acquiring literacy skills, but also the support systems provided by the family and social community for learning these skills. Cochran-Smith (1984), suggests that literacy events are embedded within multiple contexts, each of which affects the child and the literacy event.

Light and Kelford-Smith (1993), identify three literacy contexts as being of critical importance for young children. Firstly, there is the physical and functional context that refers to the elements of the child's actual physical environment as well as the structure and function of daily activities. Secondly the language context, which refers to the interaction between adult and child within literacy activities and the patterns of language use within these interactions. Finally, the cultural context that refers to the parents' and communities' values and beliefs about literacy and their expectations for literacy development.

A survey of adults with SSPI revealed that, in addition to their own talents and abilities, they attributed their literacy success to the support of their parents, an aspect of the sociocultural context (Koppenhaver, Evans, & Yoder, 1991). Koppenhaver, Pierce, Steelman, Staples, Erickson, & Yoder (1994), conclude that the results of these studies strongly suggest that the literacy learning difficulties experienced by many AAC users may be as much related to the environment's response to an individual's disabilities as they are to the nature of the individual's disabilities.

Even fewer studies have examined the interactions of individuals' abilities and disabilities with the multiple contexts where literacy learning occurs. It appears, however, that many individuals with SSPI receive very little actual literacy instruction from the time they enter school. Koppenhaver and Yoder (1990b) report that 30% to 40% of the instructional time of three adolescent boys with cerebral palsy was devoted to non literacy activities such as toileting, waiting, or preparing the computer. Most of the instruction that did occur was spent working one-to-one on workbook pages, an activity that Rosenshine & Stevens (1984) have found to be unrelated to achievements

in reading by non disabled children. Furthermore, Anderson, Wilson, & Fielding (1988) report observations indicating that children with SSPI had practically no opportunities during a normal school day to perform silent reading and text composition, activities thought to be most related to literacy learning in nondisabled students.

In their survey of the successful literacy experiences of 22 literate individuals with cerebral palsy, from 16-55 years of age, Koppenhaver, Evans & Yoder (1991) asked about early reading and writing experiences. Their aim was to examine whether literate adults shared similar childhood experiences as children, which might account for their success. They found that when these individuals were in school, they participated regularly in a variety of reading experiences such as reading and listening to stories, repeatedly reading the same texts, responding to questions proposed by the teachers, and discussing reading and writing with their teachers. In addition they mentioned visiting libraries and bookstores and participating in independent and silent reading sessions. Many indicated that they were taught new vocabulary words before reading stories, and that they were read to by their teachers.

In addition, they emphasised the critical role of family members reading aloud to them while they viewed the text, and providing them with opportunities for social interaction through discussions of the stories read, and by observing others reading for functional purposes. Other important aspects included the existence of accessible printed materials, regular opportunities to choose their own reading materials and to observe others reading to them. More than the educational system, they credited their success to the combination of their own talents and persistence together with the support and high expectations of their parents (Koppenhaver, Evans & Yoder, 1991). The researchers concluded that contributions to literacy learning in nondisabled individuals, such as being read to frequently and having access to print materials, also appear to facilitate learning in individuals with SSPI.

Writing at home was limited in the experience of 6 adolescents with SSPI, who developed literacy skills later in their academic careers. A study of their writing abilities and skills found that all six demonstrated difficulties with written language syntax, leading researchers to wonder whether they had language based deficits (Kelford-Smith, et. al., 1989). As all of the adolescents were Blissymbol users, the authors questioned whether the nature of the AAC symbols might have an impact on literacy acquisition since symbols are content rather than form based.

Another survey compared the home literacy experiences of physically disabled preschool AAC users to the experiences of their nondisabled peers (Light and Kelford-Smith, 1993). The two groups answered questions about the nature and availability of printed and writing materials in the home, the function of reading and writing in the home, parental expectations for their children, the roles parents and children play during story reading activities, and the support provided.

It is interesting to note that all parents considered communication their highest priority. However, while parents of able-bodied children ranked making friends as their next priority, parents of children AAC users listed feeding, mobility and toilet training as high priorities. For the latter children, making friends, reading, writing and dressing were listed as low priorities. Children in both groups had access to literacy materials at home. However, the AAC users interacted with literacy materials 2/3 times per week while able-bodied children had daily access to it.

Blackstone (1989) suggests that the early literacy experiences of children with SSPI are likely to be distinct both in degree and in kind from those of able-bodied children. She emphasises that AAC users give greater relative credit to parental support and their positive expectations when explaining their successful literacy efforts. Light and Kelford-Smith (1993) found that parents of AAC users reported mothers as being primarily responsible for teaching their children reading and writing skills, before mentioning their teachers. On the other hand, parents of able-bodied children

considered teachers in the first place and then parents. Researchers suggest that mothers of AAC users may naturally assume responsibility in teaching reading and writing skills, as a result of a long term responsibility for home intervention programmes such as feeding, physiotherapy, and communication programs.

The greater relative importance of home support for literacy in AAC users in no way reduces the role of the educational institution. Children with SSPI will inevitably require additional support upon entering school, while even those adolescents/adults who have not yet developed functional literacy skills can do so if ongoing support is available. In conclusion Light and Kelford-Smith (1993) support a collaborative model of literacy intervention for preschoolers using AAC systems, with home and school working together.

2.5.5. The Emergence of Literacy

During the past 15 years, much research has been done based on new ways of conceptualising the early childhood literacy learning. A new term "emergent literacy" came along with this new perspective on the development of reading and writing (Sulzby, E. & Teale, W. 1991). The term emergent literacy has since the early 1980s, gain currency as a term both in the research community and among practitioners.

The importance of literacy in early intervention is becoming increasingly evident. However parents and professionals lack the necessary training, materials, and support to provide effective early literacy experiences for children with SSPI. Research into the characteristics of emergent literacy in children with SSPI is necessary to better equip these people in their efforts to foster literacy. Such research is on-going. However, it has so far ignored the phase of emergent literacy for such children.

Sulzby & Teale (1991), describe emergent literacy as the reading and writing behaviours that precede and develop into conventional literacy. The associated

experiences include familiarity with books and stories, drawing and scribbling, and sequencing ideas as described more fully in 2.5.8. McWilliam & Coleman (1992), ascribe the acquisition of both reading and writing skills to this period. For their part, Teale & Sulzby (1986) think of the concept in terms of "what children know about reading and writing, and how they learn it, before formal instruction begins". This concept of emergent literacy, that Koppenhaver, Coleman, Kalman & Yoder (1991) defend, permits a broader view in which literacy, like language learning, is seen as a continuous process, beginning at birth. As stated by Koppenhaver, et. al., (1991) what is done to enhance emerging literacy skills will likely enhance language and communication skills. On the other hand the development of the child's language and communication skills, facilitates his/her ability to be actively involved in literacy events, contributing to their literacy acquisition. It is just as critical that young children have to be provided with the necessary environmental stimuli to assist literacy skills to emerge as it is that oral language and communication skills, are facilitated.

The concept, as further argued by the same authors, acknowledges the non-conventional behaviour of young learners as reflective of their underlying understandings and beliefs about the nature and uses of print. In typically developing children, emergent literacy comprises the period between birth and first grade.

Recent studies have begun to ask how individuals who are unable to speak develop literacy skills, and what effect their context and experiences have on literacy development. Children using AAC often do not show evidence of the emergence of literacy skills and are, therefore, at a disadvantage in learning to become literate in the traditional sense. With a few exceptions, the research into emergent literacy has ignored the early literacy learning of children with SSPI .

Working both in home and school contexts, interest in emergent literacy has concentrated on communication (Coleman, 1991), situational contexts (Koppenhaver, Evans, & Yoder, 1991), and sociocultural ones (Light, & McNaughton, 1993). These

studies conclude that adult-child interaction patterns, classroom and home environments, and teacher/parents attitudes, expectations and priorities, are often not conducive to optimal literacy learning in children who use AAC systems.

Traditional thinking has centred around the idea of a reading readiness stage before which time real literacy learning can not take place (Galda, Cullinan & Strickland, 1993). In fact the use of birth dates to determine school entry and therefore the onset of formal, structured learning feeds into this concept of readiness. However, as Teale and Sulzby (1989) observe "for almost all children in a literate society, learning to read and write begins very early in life" and what Maehr (1991) refers to as the earliest literacy experiences of children actually occuring in the crib. This often takes place before six months of life, as parents read books to their children.

This philosophical perspective suggests that literacy like language learning, is a continuous process beginning at birth (Teale & Sulzby, 1986). They observe that this concept of emergent literacy is relatively recent, although research into reading and writing of young children has a long history.

A common theme that is seen in current writings is that reading, writing, speaking and listening abilities develop concurrently and interrelatedly as represented in Figure 2.3. rather than sequentially as in Figure 2.4. (Koppenhaver et al. 1991; Maehr, 1991; Teale & Sulzby, 1989).

Current Thinking
(Concurrent and Interrelated Model)

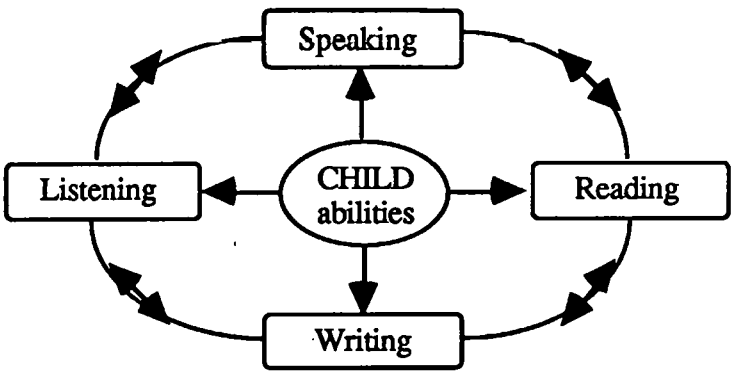


Figure 2.3: Concurrent and Interrelated. Model of literacy development. Koppenhaver et al. 1991; Maehr, 1991; Teale & Sulzby, 1989

Traditional thinking has artificially separated these processes and attempted to teach them in a lock-step fashion, beginning with listening, progressing to speaking, then reading, and finally to writing.

Traditional Thinking
(Sequential Model)

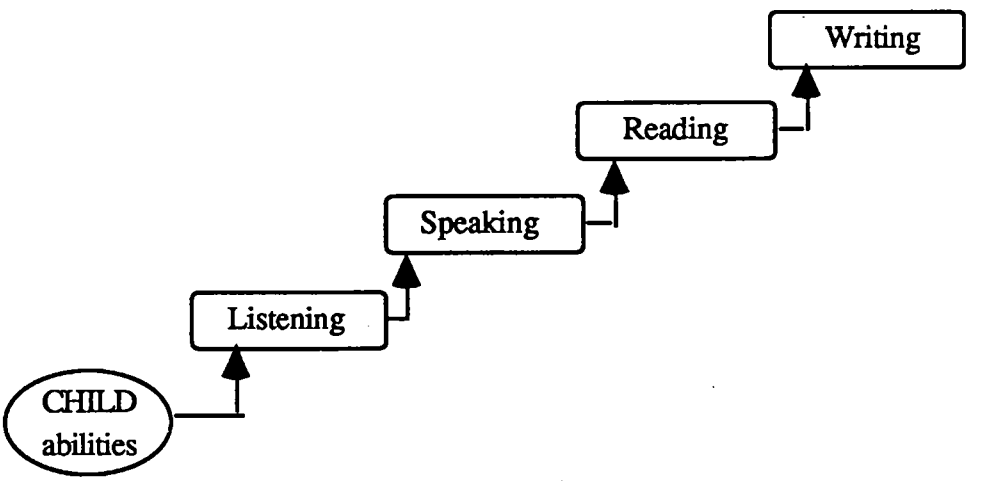


Figure 2.4: Traditional Thinking Model of literacy development.

This sequential type of view was questioned by Ferreiro, & Teberosky, (1983). They questioned specific practices such as testing procedures that perpetuated the sequential notion and focused strongly on alphabet skills as a prerequisite to reading and writing skills.

This approach is in opposition to the concept of emergent literacy, which avoids the practice of labelling activities as prerequisites, then delaying teaching until the magical level of "readiness" is reached. If we accept that all four components develop together it is more understandable that children mix conventional and unconventional forms in their early writing (Clay, 1975; Ferreiro & Teberosky, 1979; 1982). Thus, a child who is learning and growing in all areas of literacy can be expected to mix scribbling, drawing, and invented spelling in the same production. Rather than labelling these activities as "prewriting" they are now seen as a valid expressions of emergent literacy. As noted by Koppenhaver, Coleman, Kalman & Yoder, (1991), notions of prerequisites have made intensive exploration of literacy learning in children with developmental disabilities seem doubtful until recently. The emergent literacy approach erases the *not-ready-for* labelling that is too often stamped on children with disabilities. It is a most inclusive concept, inviting all students to participate.

2.5.6. Barriers which influence the process of learning to read and write

Cutting, (1989) addresses key factors in learning to read and write. These key factors were lately analysed by Musselwhite & King De-Baun (1997), and related to general literature on reading achievement, as well as literature relative to individuals with various types of disabilities. The key factors mentioned by the authors are represented on the following figure:

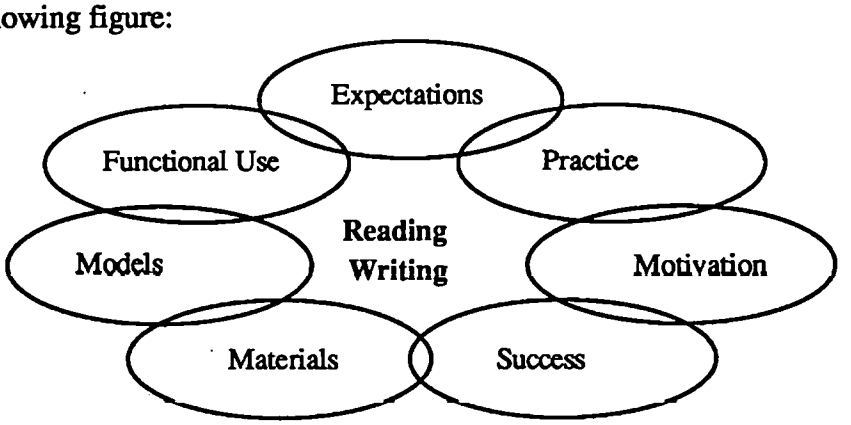


Figure 2.5: Key factors in learning to read and write (Musselwhite & King De-Baun, 1997)

Expectations of Learning

The importance of expectations of learning, are supported by the study of Koppenhaver, Coleman, Kalman, and Yoder (1991) regarding the concern that labels, such as "disabled", "delayed", along with a child's behaviours, may cause caregivers to underestimate the abilities of children with learning difficulties. This may lead to reduced expectations relative to literacy learning, by parents that do not view their children as potential readers. Light, et. al. (1990), carried out a survey suggesting that parents of children with severe speech and physical impairments rated literacy as a low priority, and care of physical needs as high priority.

Light and Kelford-Smith (1993) surveyed parents of nondisabled preschool children and parents of preschool children with physical disabilities who use AAC devices, about their expectations for their children's future achievements. Literacy achievement was consistently rated as a higher priority by parents of speaking children. For children who used AAC devices, parents were more concerned with the development of self-help skills and face-to-face communication proficiency. Marvin and Mirenda (1993) conducted a survey to compare the home literacy experiences of 291 preschool children with special needs. One of the areas surveyed was that of parental goals for their children. Almost two thirds of the respondents placed the lowest priority on their children's literacy development and had the lowest expectations for their literacy development.

On the other hand, a survey of 21 literate adults with severe speech and physical impairments, by Koppenhaver, Evans, and Yoder (1991) was more positive, indicating that mothers were cited by 86% of the respondents as having played a central role in their literacy accomplishments. In addition, parental support and high expectations were listed by 12 of the 21 respondents as key factors for their literacy success.

Attention to meaning rather than form

The second key factor is related to the functional use of literacy, which means paying

attention to meaning rather than form. Koppenhaver, Coleman, Kalman, and Yoder (1991) assert that literacy development is best fostered when reading and writing are used to get something, to accomplish a goal. Teale & Sulzby, (1986) make a similar observation, that literacy develops in real-life settings for real-life activities in order to "get things done". Teale (1987) reported that only 12% of literacy activities observed or participated in at home by young children involved literacy for its own sake; the remaining 88% consisted of literacy as a mediator of various daily living activities (entertainment, daily living routines, work, and so forth).

Opportunities for Practice

Practice is one component of immersion, or surrounding children with print and opportunities to use print (Cambourne, 1988; Eisle, 1991). However, in many classrooms, opportunities for practice may be limited. Goodman (1986) reports that reading accounts for only 6% of elementary class time, and tails off to 3% in junior high school and 2% in senior high. This data is based on observations with able-bodied students. A number of studies have suggested reduced opportunities for practice for children with disabilities. For example, Lorenz, Sloper, and Cunningham (1985) report that many children with Down's syndrome do not come into contact with books until ages eight or nine. The situation with regard to writing tools for children with physical impairments is equally discouraging, with such children rarely having access to writing tools or the opportunity to use them (Koppenhaver, Evans, and Yoder, 1991; Light, Kelford-Smith, and McNaughton, 1990).

In the Marvin and Mirenda (1993) survey, previously described in this study, researchers reported few adult-facilitated literacy activities at home. Few children were reported to hear rhymes and poems or to go to the library. In addition they were rarely engaged in literacy interactions such as predicting what will happen next in a story and why, and story retelling. The authors suggested that these limited experiences, that could not be explained by low socioeconomic factors, may be due to reduced expectations on the part of the parents. As a conclusion they suggest that reduced

expectations and reduced opportunities for practice may be correlated for children with disabilities.

On the other hand, physical impairments including poor communication skills and limited mobility may be factors contributing to differences noted in Light and Kelford-Smith's (1993) survey of preschool children without disabilities and preschool children using AAC systems. The two groups had similar home reading and writing environments, in terms of the range of reading materials available, as well as regular models of reading and writing. Equal interest in literacy activities was also reported for the two groups. However, children in the AAC group had fewer opportunities to use printed materials or to participate in drawing and writing activities, therefore affording them less practice. They also heard fewer repeated readings of familiar stories. The authors suggest that, since the nondisabled students typically initiated story reading, they choose books that were familiar as they are more confortable with the interpretation of the story and can anticipate their roles. Since mothers typically initiated story sessions with AAC children, they were more likely to choose varied books, as they tired of repeated readings of the same book.

In summary, Koppenhaver and Yoder (1991) report that important contrasts exist in the frequency and nature of children's activities with printed materials. For example, during reading activities, children with severe speech impairment often lacked access to their AAC devices and appeared to play a more passive role, typically restricted to looking at or pointing to pictures. The importance of sufficient opportunities is also stressed by Norris and Damico (1990), as well as the need to maximise active participation.

Models of Reading

Being surrounded by reading and readers, is another important key factor to be analysed. The literature is in agreement on the need to provide consistent models of literacy use. Hall (1987) asserts that print must have a high profile in the learner's

environment, and must be granted high status through frequent use in a variety of purposeful activities. The survey by Koppenhaver, Evans, and Yoder (1991) of literate adults with severe speech and physical impairments underscores the role of modelling. Nearly 86% of the respondents observed family members reading for pleasure at least two and three times per week. They were also read to regularly by others (71%).

The study by Light and Kelford-Smith (1993), comparing home literacy experiences of preschoolers who use AAC systems and their nondisabled peers, found that reading and writing activities of the families did not differ. That is, both groups of students received similar models of literacy in terms of frequency, purposes, and enjoyment of reading and writing events. One special concern regarding models is that children with severe disabilities may not be located or positioned to see everyday models of literacy events such as a sister looking up a number in the telephone book, mother making the grocery list, father reading before getting to sleep. Because of their position and in some cases the head support children with severe impairments have to use on their wheelchair, they may be unable to view literacy events that occur nearby but out of their restricted range of vision. Children who are highly mobile, on the other hand, would be more likely to see each of these events.

Motivation

The survey of literate adults with severe speech and physical impairments (Koppenhaver, Evans, and Yoder, 1991) makes it clear that motivation, the next key factor, is a powerful force. Several respondents credited their success in literacy learning to their "stubborn" personality, with an unwillingness to give up. Parents, teachers, and other caregivers must strive for ways to instil or support such motivation, allowing and encouraging students to have fun while learning.

Success

It is crucial that students with impairments experience success in literacy activities at some level, to encourage them to continue, and to enhance a positive self-image.

Brown (1954) wrote his initial autobiography with a pencil held between his toes. He reports the feelings of success each time he mastered a new word and could write it down. Goodman (1986) shows that students can have success by learning through risk-taking and error. Cutting (1989) insists that, for children at the emergent reading stage, "... the emphasis should be on reading books and behaving like a reader from the very first day". He further states that "Whatever their teacher says 'reading' is and will be reading" .

As King-De-Baun (1990; 1993a; 1993b) states, repeated readings of the same story promote the feeling of success, as students can quickly get the feel of being a reader. Cutting and Milligan (1991) note that emphasis should not be on spending time on reading readiness activities and that effort should be made to permit children to impress their families by for example taking home a book they can read soon after they enter the school. This book will likely be one that they have enjoyed through repeated readings.

Materials

The literature is divided on issues of access to materials that support literacy. Bradley, Rock, Calwell, & Brisby (1986) report that preschool children with developmental disabilities are often provided with fewer games, toys, and learning materials than their nondisabled peers. As mentioned above, Lorenz, Sloper, and Cunningham (1985) report that many children with Down's syndrome do not come into contact with books until ages eight or nine. Several studies have suggested that children with physical impairments have less access to writing tools (Light, KelfordSmith, & McNaughton, 1990: Koppenhaver, Evans, & Yoder, 1991; Marvin & Mirenda, 1993). One study (Light & Kelford-Smith, 1993) did not find significant difference in availability of printed materials or writing materials for preschoolers without disabilities and preschoolers using AAC systems. Researchers generally agree that all children must have access to a variety of materials to enhance literacy development.

2.5.7. Whole Language Approach to Reading

How do children move from Emergent to Conventional Literacy? Juel (1991) describes this transition as the move from contextually bound "readings" of print (e.g., recognising "Stop" on a stop sign) to bound readings (i.e., how the child reads "Stop" when it is not embedded in a street sign). As he argues, this transition can occur in three stages:

First the "Selective-Cue Stage" ,where the child learns to recognise a word by selecting some cue that distinguished it from other words. Sometimes he/she attends to random features of either the environment in which the print occurs or some features of the print itself. At this stage, the child attends to minimum graphic information and maximum contextual information.

Second, the "Spelling-Sound Stage", when the child attempts to represent sequences of phonemes onto sequences of letters and identifies unknown words by attending to maximum graphic information.

Finally, at the "Automatic Stage" , the child recognises most words "holistically" through automatic processing of their "visual" orthographic features (Ehri, 1987).

Traditional thinking has centred around the idea of a reading "readiness" stage, before which it would be unproductive even to attempt to introduce literacy. The concept of emergent literacy (Teale and Sulzby, 1986) has brought significant changes. It allows a broader view, in which literacy, like language learning, is seen as a continuous process, beginning at birth (Koppenhaver, Coleman, Kalman, and Yoder, 1991; Buckley, 1985; Carpenter, 1990), erasing the "not-ready-for" labelling that is too often stamped on students with disabilities. As argued by Musselwhite (1993b), the request for literacy, when viewed from a whole language perspective, seems more applicable, especially for young children with disabilities.

Cutting (1985) suggests that language is learned most easily when it is whole, functional and meaningful; when the focus is on what it is used for, and not on the language itself. Whole-language is really a learning model, closely related to how children learn their language in the first place. Emphasis is placed on the child's active use of language in all its forms. The instructor should capture the "teachable moment", understanding the importance of monitoring the individual learner's strengths and competencies and acknowledging each present success. According to Norris & Damico (1990), the term "whole language" is used to describe an approach to literacy instruction that recognises the inter-relationships between reading, writing, speaking, and listening and encourages the simultaneous development of each.

According to Blackstone (1989), essentially two approaches to the teaching of reading are used by educators: the "whole language approach", emphasising meaning, whole word in context as a language experience, and the "skill development approach", emphasising phonics, decoding and encoding skills (Gersten & Dimino, 1993; Norris & Damico, 1990). Many educators are altering their views of the ways in which reading should be taught to include the whole language approach.

The ideas and philosophies of whole language offer the educator some guidelines for presenting materials to students (Musselwhite, 1993; King-DeBaun, 1990; 1993a; 1993b), which seem attainable and fun. Incorporating a whole language type approach into the classroom routine can provide the educator with a focus. The idea that one topic or theme is incorporated into all activities provides the child with ample opportunities to internalise and learn new concepts across a wide variety of related activities.

Graphic representational symbol use for literacy development in children with SSPI closely resembles this "whole language approach". Burckhart (1993) refers to "total augmentative communication" as an approach of this type especially suited to children with SSPI. This approach integrates the concept of multi-modality and multi-

component communication throughout the curriculum. It represents the use of a wide range of lowtech and hightech approaches to facilitate the development of communication skills for students with severe communication impairments.

Goossens', Crain & Elder (1992) present a key strategy for engineering the AAC student's environment. As they state, it permits at least 80% of activities to be overlaid with augmentative communication. For that purposes Goossens' et. al. (1992) proposed a classroom environment immersed with pictures and symbols for symbolic communication. Within the engineered environment, communication may take the form of: signs, symbols in a wide range of formats, speech output support, and other forms of assistive technology. The young child sees symbols being used frequently, interactively and naturally. Communication displays are activity specific and are placed in the area where the activity occurs.

The facilitators within this environment use a technique called "Aided Language Stimulation" (Goossens', 1989). This strategy requires that all facilitators model interactive use of AAC systems used by the students on an ongoing basis, throughout all aspects of programming. When conducting Aided Language Stimulation, the facilitator points to symbols on a communication display in conjunction with all ongoing verbal language stimulation being directed toward that child, making language visible (Goossens', Crain, & Elder, 1992). An environment immersed with rich language models including such practices as an engineered environment for symbolic communication and aided language stimulation, can in fact enhance the development of both verbal and nonverbal communication.

2.5.8. Story Reading Interactions to promote literacy

Numerous authors have highlighted the importance of interactive story reading experiences in particular as critical in the development of language and literacy skills in

young children (Cazden, 1983; Snow & Ninio, 1986; Wells, 1985a;1985b, 1987; Ferreiro & Teberosky, 1983; Teale & Sulzby, 1986; Scarborough, Dobrich & Hager 1991).

Through story reading in the preschool years, children learn the "contracts" of literacy: how to give attention to books and how to derive meaning from books; how to "talk" about the content of books; how to handle books as objects of thought, not as toys; how to follow the topic established through the story; and how to interpret the pictures and text of the book as symbolic representations, not the "real thing" (Snow and Ninio, 1986).

Story reading activities, as distinct from other experiences with print, play an important role in facilitating literacy development, since they introduce children to the form of reflective thought and decontextualized language that is so much a part of most classroom experiences.

In a longitudinal study on the effects of picture book reading in 32 normal children, Wells (1985b) discovered that the frequency of listening to stories between 1 and 3 years of age, was significantly associated with literacy and teacher ratings of oral language skills at 5 years of age, as well as to reading comprehension at 7 years of age.

The same author (1985a) found that approximately 5% of the daily speech of preschoolers occurred in storytime settings. Also looking at the same situation, Ninio and Bruner (1978) (later supported by Snow and Goldfield, 1983, and Moerk and Moerk, 1979) found that 75.6% of all instances of labelling occur in that context, and mothers provided consistent and informative feedback, correcting and reinforcing the child's attempts at labelling. Wells (1987) argued that, through story reading interactions with their parents, children are introduced to the form and cadences of written language and to ways of taking meaning from extended discourse, thus laying the foundations for literacy development.

Shared reading is, according to King De-Baun (1995), not merely reading aloud to a group of passive listeners. Rather, she states, the interventionist shares good literature, reading it with students, (not to), who are very active participants. She created curriculum activities for disabled children around simple original stories (King DeBaun, 1990; 1993a). The stories emphasise early language concepts relevant to young children and provide a focus for a variety of curriculum activities using a "whole language" approach. A variety of strategies are utilised to invite children to initiate and express themselves. As stated by King DeBaun (1993a), a whole language approach sets the stage for success which yields confident learners and risk takers.

Light, Binger and Kelford-Smith (1994) pointed out that, to date, there has been little research to investigate the literacy experiences of people who use AAC. There is however, according to the same authors, a significant body of literature on literacy development with nondisabled children that may provide guidance in suggesting some factors that play a key role in the literacy development of AAC users. This literature indicates that the early literacy experiences of preschoolers at home, especially their story reading experiences, are of critical importance in establishing the foundations for the development of reading and writing skills (Cazden, 1983; Snow & Ninio, 1986; Wells, 1985a; 1985b, 1987).

The development of reading and writing skills is particularly important for children with SSPI who are AAC users. However according to the studies of Light, Binger, & Kelford-Smith (1994), Light & Kelford-Smith (1993) and Pierce & McWilliam (1993), the storybook reading experiences of these children are quite discouraging. Overall these children are placed in a passive, respondent role, with few opportunities to either predict story outcomes, or to retell the story. Given these limited opportunities for participation in storybook reading, young children with SSPI may be at risk for a delay in emergent literacy development and related language skills.

Koppenhaver & Yoder (1990b) identified four areas of importance when examining

the impact of features of using texts and technology on the learning process of children with SSPI. The enhancement of bookreading enjoyment and opportunities is considered important, since often they have less exposure to bookreading, due to physical and cognitive challenges, which may result in having less pleasure from the activities. According to Musselwhite (1993a) students can actively contol events that are considered as important in the process of emergent literacy development. Page turning (asking to turn the page when reading), viewing a page (asking to see the pictures in the book), repeating lines (calling out fun repeated lines at appropriate time) or acting out funny events in the story, are all active participation strategies that enhance general enjoyment of bookreading.

Storybook reading and discussion is the second important area identified by Koppenhaver & Yoder (1990b). Students can make comments, generic ones or specific, to the book being read, that are programmed in voice output devices. In the same way they can participate in group discussion. Word-point reading is another feature of importance for the literacy learning process. It can be encouraged either by pointing or flashlighting to cue words as they are read, or by enlarging the format of the letters. Finally there is the possibility for students to be engaged in beginning storywriting, being enhanced by the use of computers or voice output devices.

The study of Morrow, O'Connor & Smith (1990), investigating the effects of a storybook reading program as one means for literacy development with at-risk preschool students, reinforces the findings of earlier research, showing that comprehension of narrative and sense of story structure are enhanced when children are actively involved in story reading processes (Cochran-Smith, 1984; Morrow, 1988; Pellegrini & Galda, 1982; Teale, 1984).

Light et al. (1994) and Pierce & McWilliam (1993) gave some suggestions for enhancing the linguistic participation of children with SSPI during storybook reading. Results from these studies support the hypothesis that children with physical

disabilities are more dependent on others in their environment to provide them with access to reading materials than their nondisabled peers. However, research documenting the efficacy of intervention in this area is needed.

Light, Binger & Kelford Smith (1994) discussed the early literacy experiences of five preschoolers with SSPI, who were AAC users. These researchers investigated the interaction patterns of the five children and their mothers, during story reading, contributing to the empirically based knowledge of such experiences in children who use AAC systems.

This study describes the participation patterns, the focus of the interactions, and the communicative modes and behaviours of preschoolers who use AAC, during story reading activities. Results of this study indicate that children forfeited many of their communicative opportunities, the participation was asymmetrical, that they shared with their mothers the same focus in the interaction, and that the mothers dominated the exchanges.

Since story reading is so important in establishing foundations for language and literacy development, researchers (Light, Binger, & Kelford-Smith, 1994) strongly suggest that it seems important to gain a clear understanding of the story reading experiences of children with severe speech impairments who use AAC systems. To date, little is known about these experiences.

Literacy development is of course not restricted to story reading experiences. Goodman (1980) argues that learning language is learning how "to mean". As it proceeds, the child learns how to express meaning through written as well as spoken language.

Initially, as children interact with literacy events and incorporate them into their home and social environments, they grow curious and form hypotheses about their functions and purposes. As they participate in literacy events, actively reading and writing, they

develop according to the same author, three major beliefs about written language:

- relationally, children understand about the ways that meaning is represented in written language
- functionally, children understand the reasons and purposes for written language
- linguistically, children understand how written language is organised and displayed so that communication can occur, considering the orthographic, graphonic, syntactic, semantic, and pragmatic systems of language.

Chomsky (1981) and Ferreiro (1986) have argued convincingly that access to writing materials in the preschool years is critical to literacy development. As stated by Light & Kelford-Smith (1993), written communication allows individuals with severe speech impairments the opportunity to initiate topics, to develop ideas, to provide clarification, to communicate independently, to interact with a diverse audience, and to express ideas, thoughts, and feelings free from the constraints of face to face interaction.

Koppenhaver, Pierce, Steelman & Yoder (1993) state that early studies of children with learning difficulties suggest that print-related activities seem not only to help develop a child's ability to understand and use written language, but also to develop the content, form, and use of their oral or augmented communication.

As well as gaining meaning through reading, young children also need access and opportunity to produce meaning with written language. Koppenhaver and Pierce (1992) debate how young AAC users are already writing, in a sense, as they combine graphic symbols to produce meaningful utterances. AAC users' symbol systems are their input which is translated into more conventional written output. Whilst recent computer software allows symbols to be both selected and written, producing symbol materials (Detheridge & Detheridge 1997). Conversely, the use of symbols may impair or impede a developing child's exploration of sounds and sound combinations and, above all, the opportunity to progress through developmental spelling.

Berninger and Gans (1986) studied the written language profiles of three individuals with severe cerebral palsy and found that these individuals were underachieving in reading relative to their skills in processing oral language. They suggested that these deficits may have resulted from the subjects' limited access to systematic programming and regular literacy experiences.

A supportive communication environment offers ample opportunities for children to communicate: ways for them to communicate, motivating and functional activities for them to communicate about, and consistent and reinforcing responses to their communication attempts (Tronick 1981).

These communications, as argued by Koppenhaver, Pierce, Steelman & Yoder (1993), enable children to make sense of literacy events, to incorporate content and process into their understanding of the uses of print, and to develop increasingly conventional forms of print.

As students appear to learn to read by reading, they appear to learn to write by writing. For many, this is a slow and laborious process, even with adaptive equipment, but it appears essential that students with physical impairments have ample opportunities to compose written text (Koppenhaver &Yoder, 1990b).

Whether or not children with learning difficulties attain high literacy levels, their understanding and use of more complex language structures, syntax, and vocabulary can be enhanced by participating in story reading and writing activities. These children can learn concepts and functions of print that will allow them to use print more independently.

2.5.9. Graphic Representational Symbol Use and Literacy Development

McNaughton & Lindsay (1995) examined any possible impact that graphic representational system teaching and use might have during the emergent literacy years of young children with severe speech and physical impairments. The authors looked at the possible influence of the graphic representational symbols upon the nonspeaking child's early reading and writing concepts, behaviours, attitudes, and skills. They concluded that for young children with SSPI, the role of graphic symbols in mediating language, cognitive, and visual processing experiences, may be as important as its communicative and conceptual functions.

The authors worked on the basis of the following assumptions about types of impairments and their effect on the formative years of children with SSPI. First of all, the children were assumed to lack the fast, novel, self-initiated stream of expressive utterances and the range of interactive communication experiences possible only through speech; and it was further assumed that such world knowledge was limited or, at best, distinct in the way information is organised, due to their different sensory and motor experiential base. The authors commented, however, that AAC users also benefit to the extent that they have the unique opportunity to regularly use a graphic symbol system that is highly dependent on visual processing when other children have begun to rely on speech. The authors concluded that symbol sets or graphic representational sets have a positive effect on written language development by serving as a scaffold for expressive communication.

In a related vein, Carpenter (1990) uses Sidman's concept of stimulus equivalence (1971) to argue that symbols might enhance children's cognitive development, since each word brings together speech, sign, symbol and orthography. However, Bishop, Rankin & Mirenda (1994) challenge these conclusions saying that symbol sets may

have little impact on written language development, beyond providing general access to language and communication.

According to Vygotsky (1986), higher mental functions are products of "mediated" activity, which, in turn, is played by psychological tools and means of interpersonal communication such as gestures, language and sign system, mnemonic techniques, and decision-making systems. Children are active participants in a mediated learning experience. In the case of young non-disabled children, speech provides an oral symbolic representational system that serves as the primary mediator of their learning experiences and as the vehicle for both expressive and receptive communication. On the other hand, for children with SSPI, a graphic symbolic representational system must play the primary mediating role for their expressive language. They use speech only as their receptive medium.

Carpenter's investigation in 1987, of the value of symbols in the reading process for children with severe learning difficulties, confirms that the use of symbols as a mean of communication helps those children learn to read. He expresses the hope that, in some cases it may be possible for the child eventually to replace the graphic symbols by speech and/or printed words in the learning situation (Carpenter, 1987b). These findings were substantiated when a research project with children with SSPI at the Centre for Cerebral Palsy in Lisbon demonstrated significant improvements in literacy learning following intensive use of AAC systems (Nunes da Ponte & Azevedo, 1993).

Several researchers have expressed concerns, however, about the transition from the spoken to the written word. Blackstone (1989), for example, considers this phase critical, since, she points out, it is usually at this point that many children with severe learning difficulties reach a plateau. Thus, she considers the question of when to shift from symbols to traditional orthography to be a critical decision. On the other hand, other investigations have used symbols to mediate the transfer to the printed word (Carpenter, 1987; Van Osterom and Devereux, 1984, 1985; Walker et. al., 1985;

Carpenter & Detheridge, 1994; Detheridge & Detheridge, in press).

Carpenter (1995) building upon the mediated transfer paradigm of Sidman & Cresson, (1973) argued, using the following figure, that symbols act as a "perceptual bridge", supporting students with learning difficulties in their acquisition of reading skills. He suggested that the symbols usefully support the transfer and application of that equivalence in the context of sentence structure and formation, while their graphic quality, acting as a visual representation of children's language, offers new ways of learning. Another advantage of symbols, he argues, is their capacity to refine and distil the essential information contained in the word message.

Traditional orthography (TO) can be well supported by symbols as they form a corresponding single unit of information. They can elaborate the content, context and meaning of the word, without diverting the child's attention away from the central process of task implementation and comprehension. Furthermore, he argues, interpreting symbols is not a superfluous skill because society is full of symbols. Thus the ability to decode and act upon the meaning of symbols is a useful social skill.

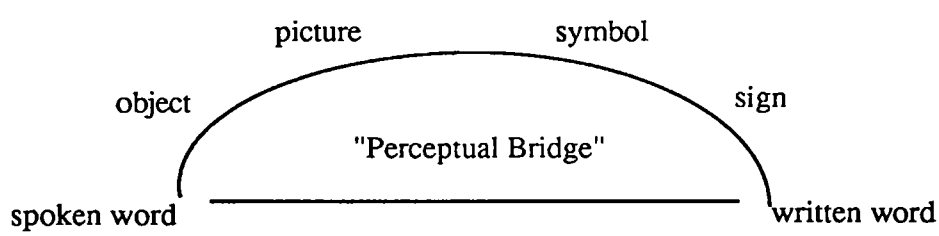


Figure 2.6: The "Perceptual Bridge" (Carpenter, 1995)

As was mentioned above, Goodman (1976) defines reading, as "a complex process by which the reader reconstructs to some degree a message encoded by a writer in a graphic language". This graphic message, Carpenter (1987) has pointed out, had its origins in verbal language, which may be vocalised or internalised. Verbal language, in turn, can be defined as a code in which facts and ideas existing in the word are represented through a system of signals/symbols. Whereas the signals used in spoken

language are acoustic, graphic language uses graphic ones. Both have a specific linguistic structure, consisting of phonological cues which combine to form segmented units (e.g.: words).

In the process of graphic reconstruction (or reading), Carpenter (1987) has identified three areas of concern. In the first place, information processing requires the comprehension of verbal messages, which, in turn, means some level of language development. There may or may not be an understanding of language structure. The next concern is with the development of pre-reading/reading skills, such as symbol recognition, visual and auditory discrimination, memory, scanning and searching techniques, and an understanding of context. Finally, there is the most complex skill level, the combination of pictographs and words, while using vocabulary to build sentences, make stories and generally develop written word usage.

Carpenter (1990) concludes that it is possible for children with learning difficulties to achieve in the early stages of literacy development. However, he calls our attention to the fact that they may approach the task in a different manner from that of their peers in mainstream education.

2.5.10. Assistive Technology: A Tool to Literacy

"I wish my Teacher :

wouldn't have a heart attack when my machine doesn't work!

would give me enough time to say what I'm thinking

wouldn't hit my machine when it doesn't work. That's my mouth she's hitting.

would learn how to work my communication aid.

would have more patience."

Wishes from AAC students

(Blackstone, S., 1990)

As already stated, literacy learning difficulties are prevalent among children with physical disabilities. Great numbers of students with SSPI are excluded from many aspects of literacy instruction because of the delays they may be experiencing in phonic and word building skills, and because of their physical accessing and motor planning deficits, that make pencil use a more difficult task (Koppenhaver & Yoder, 1993). Technology can represent an important means of overcoming the physical barriers to this population's independent manipulation of drawing and writing tools, access to printed materials, and participation in literacy activities.

In a very recent literature review on literacy research, Koppenhaver et al. (1994), conclude that although in the past 5 years, research in literacy learning difficulties began to change direction from a within individual focus, few studies are examining the impact of technology on the literacy learning process.

But, technology by itself could represent another barrier to children with SSPI, if not effectively integrated in the educational activities of those children. More recently the concept of technology helping persons with disabilities, is not focused on the technology itself, but on the end-users, giving rise to the concept of Assistive Technology (AT).

Assistive technology can not be considered as a specific type of technology by itself, but as the implementation of a particular - and generally well known - technology (like electronics, informatics, control technologies, etc.), for a clearly defined application by people with disabilities. In fact, the ultimate objective of Assistive Technology is to contribute to the effective enhancement of the lives of people with disabilities and elderly people, helping to overcome and solve their functional problems, reducing their dependence from others, and contributing to the integration into their families and society (Azevedo, et al, 1995).

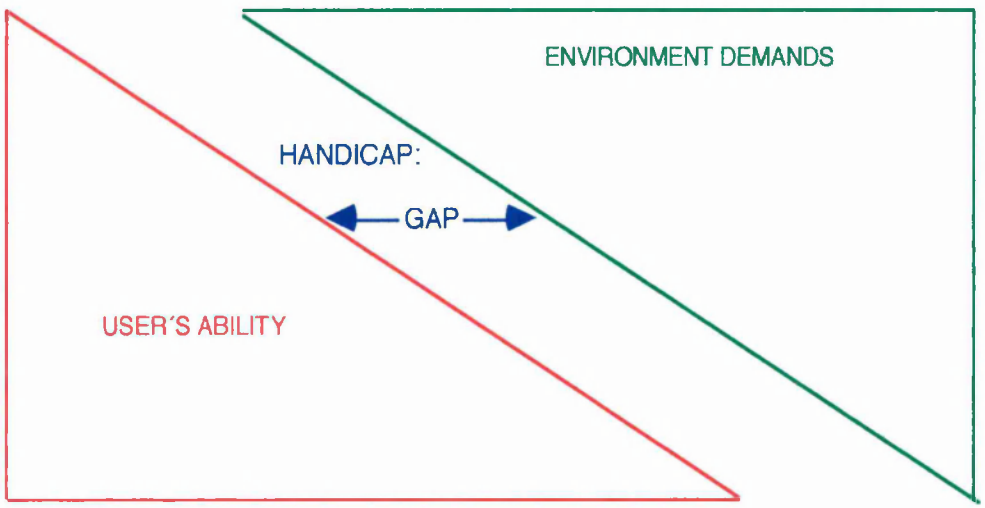
Based on the International Classification of Impairments, Disabilities and Handicaps (ICIDH), adopted by the World Health Organization, the Handicap classification is

rather a classification of circumstances, in which people with disabilities are likely to find themselves, placed at a disadvantage relative to their peers when viewed from the norms of society.

As a consequence, "*A Handicap is characterised by the discrepancy, GAP, between the individual's performance (Ability) and the Social and Physical Environmental Demands* ". In a recent Study -the HEART Study- produced by the European Union about Assistive Technology, the relation between the environment demands and the person's ability could be schematised by the following:

HANDICAP:

(The environment demands more from the disabled person than the ability permits)



(HEART Study, Line E Final Report, 1995)

Figure 2.7: Model of Professional Training in Assistive Technology .

The effects of a disability can be diminished reducing the demands of the environment. Assistive technology can be used, not only to reduce those demands, but also to enhance the functional level (ability) of the user. This concept of Assistive Technology was always taken into account along this research, where the emphasis was put not on technology but on the educational models where Assistive Technology was incorporated, as an important tool to allow children with SSPI to have access to Literacy.

In the past, the use of Assistive Technology for composing and producing written text has been limited for students with SSPI: computer software applications have tended to focus on spelling and word building skills, thereby restricting the exposure of the student with spelling delays to the variety of language building literacy experiences that play an important role in literacy development. (Steelman, Pierce & Koppenhaver 1993).

Research with computers, speech synthesisers, and digitised speech suggest that speech output in combination with text output benefits word identification accuracy, spelling accuracy, motivation to write, and reading comprehension of individuals with communication disorders, including those who use AAC (Koke & Neilson, 1987; Koppenhaver & Yoder 1988; Rosegrant 1984). These findings, provide strong argument for the use of assistive technology in development of language and literacy in children with SSPI.

It is possible that, as the gap between knowledge and interest in literacy and in Augmentative Communication begins to narrow, we will begin to see dramatic changes in literacy performance among individuals of all ages with SSPI.

2.6. Research Methods

The subject of methodological issues in the field of AAC research has been well emphasised during the last seven years, at the ISAAC Research Symposiums (1990; 1992; 1994). The debates concern the approaches taken between qualitative and quantitative studies and between experimental designs, often with a clinical model, and descriptive studies, frequently associated with naturalistic studies.

During the last decades, qualitative studies have rapidly increased within the social sciences. Nevertheless, there has been a controversial debate about quantitative versus qualitative research methods. LeCompte and Goetz (1982) emphasise that the

distinction between the two research traditions is the nature of the goals, depending on the way theoretical considerations are integrated into the study, and whether it is aimed to substantiate existing theory or to generate new theories. Qualitative studies emphasise a close and direct relation between the researcher and the environment or participants, requiring flexibility and adaptability as new issues arise.

According to Light 1996 (ISAAC course), research designs are mainly of two types. Experimental research involves direct manipulation of an independent variable and measures the "effect" on the dependent variable. This type of research investigates a cause-effect relationship. Descriptive research observe and describes behaviours (dependent variables), not establishing a cause-effect relationship.

Stenhouse (1981), defines research as being a systematic and sustained inquiry planned and self-critical, which is subjected to public criticism and to empirical tests where these are appropriate. Where empirical tests are not appropriate, critical discourse will appeal to the judgement of evidence; the text, the document, the observation, the record. He further argues that in applied or action research the test or evidence may be provided by substantive action, which must be justified in other than research terms.

Research is educational to the extent that it can be related to the practice of education. Whether this relationship is to be made by a pedagogical theory at some level of generalisation or by an extension of experience which informs practice or by providing the framework for action research as a tool to explore the characteristics of particular situations or by critical evaluation of practice, or by all of these, appears to be an open question. Stenhouse (1981), concludes that teachers must inevitably be intimately involved in the research process and researchers must justify themselves to practitioners. This raises questions about whether considerations relating to research methods in special education.

2.6.1. Research Methods in Special Education

Schindele (1985) recognised special conditions and problems in the field of special educational research. These problems are grouped under five main categories:

- the population investigated in special educational research
- the environment in which the research can take place
- the special education process itself
- the problems of measurement and data collection
- the impact of ethical and moral questions

Traditionally, research in special education has been dominated by quantitative, experimental approaches, as Schindele (1985) pointed out. He further argues that the basic assumptions and pre-requisites of quantitative-experimental research may be in contrast with the nature of special education research as well as with the main goals that must be addressed by such type of research.

2.6.2. The Population

The previous chapters have already described some of the characteristics concerning the specific population of children with severe speech and physical impairments. These characteristics are in close relationship with the selection of research methods appropriate to this population. The most important factor is their heterogeneity. Although they have some characteristics in common which define them as a group (SSPI) they present many individual needs and capabilities which may make each of them a unique case.

On the other hand, they represent a very small population. The number of individuals with SSPI is very small compared to the number of individuals within the special needs population. Research which recognises the individualism of people with

disabilities suggests that small scale, interpretative approaches are likely to be more adequate than large scale quantitative methods of research.

The importance of qualitative methods in special education has been widely stressed. Patton (1990) for example, suggested the use of qualitative methods to be adequate under the following conditions:

- when the programme emphasises individual outcomes.
- when detailed in-depth information is needed about a certain population or programme.
- when the focus is on diversity among, idiosyncrasies of, and unique qualities exhibited by individuals.
- when no standardised instruments are available that can validly and reliably measure outcomes.

Qualitative research has led to insights into interpersonal interactions that influence special education practices, enabling the development of professionals' interventions responsive to cognitive and motivational interpretation of the world surrounding individuals with special needs.

2.6.3. The research environment

The various environments in which people with disabilities are educated can be very diverse. While the majority of students are educated in special schools, these can vary considerably in nature and in educational practices and philosophies. There are some in which the students spend most of their lives, as in the case of residential institutions and others where students with disabilities may be educated together with more able peers and children who do not have any disability as in mainstream schools.

The importance of studying students' behaviour in natural settings, as opposed to

clinical ones, has already been stressed by many researchers. Removing the child whose understanding of the world is so limited, from his/her familiar environment to a separate area, can be very distressing and frustrating.

The reliability of the responses, in unfamiliar environments, with unfamiliar people, are likely to be atypical, and therefore unreliable for drawing conclusions about treatments and methods in regards to social and educational development. One may then conclude that researching students with such characteristics as children with SSPI present, might be better placed in naturalistic settings.

Another factor of importance to be pointed out is the relationship between researcher, teacher and student. In educational settings the teacher is, in most of the cases, the interpreter of the student, serving as the mediator between the child and the environment around him/her. As the responsible adult, the teacher has a duty to protect the child and to ensure that observation and intervention are not affecting the child's well being.

The effect of working with very individual students and with their teachers or assistants, indicates that each situation with each student will be very different from the other. When the number of cases to be studied is small and the nature of their needs and environments in which they will respond naturally is so variable, the most appropriate approach to gathering reliable data on educational behaviours, will be through individual studies carried out in naturalistic settings.

2.6.4. Case Studies

"Case study is a strategy for doing research which involves an empirical investigation of a particular contemporary phenomenon within its real life context using multiple sources of evidence." (Robson 1993, p. 5)

From the literature review one may understand that the population with SSPI is not a homogeneous group or class and in that sense no individual case can be regarded as representative of the group. In using case study, the researcher is concerned with the observation of the characteristics of an individual, rather then with manipulation of variables to determine their causal significance (Cohen & Manion, 1989).

Because a sample usually involves individuals treated as a single group, it can be argued that it is not correct to consider "samples" of pupils with very individual capabilities and needs. A more appropriate design will be one where each individual is considered as a single case. These single-subject research designs are defined by Kiernan (1985) as studies that investigate the behaviour of a single individual, or single group. The use of a control case, or where there is a paired case upon which the intervention is not established, is similarly inappropriate.

The principle underlying case study is observing real-life phenomena in natural context, not in a clinical atypical objective situation. The analyses of the observations of the phenomena as they occur, as well as the effects of any intervention in these instances, should compare internal variations, rather than being based on any external assessments or comparisons.

"The case study researcher gathers as much information as possible about the problem with the intent of interpreting or theorising about the phenomenon" (Merriam 1988). There is an enormous probability that the phenomena being observed will be closely affected by the real life situation in which it occurs, as much as it will be inseparable from it.

When using case studies, one of the main concerns is the extent to which the observations and findings are applicable to other contexts. As Stenhouse (1978) says, the basis of verification and cumulation in the study of cases is the recognition that a case is an instance, though not, like a sample, a representative of a class and that case study is a basis for generalisation and hence cumulation of data embedded in time. The

way to overcome this difficulty is to explore the same kind of situations, using a group of single-case studies, in order to confirm and validate the observations of individual studies. This can be acquired by identifying patterns or themes and comparing results from a group of single cases. Stenhouse suggests, that the value of such observations, is in the cumulation of similar or parallel cases.

Stenhouse, (1980), identifies some points that he considered of interest in regards to case study methodology. The first is that there is an acute need for attention to be paid to quantitative aspects of case study. He argues that descriptive case studies should not confine themselves to words. A second problem he identifies is the achievement of an understanding of the relative status of observation and interview in case study, and of what is going on in each one of the problems.

2.6.5. Observation

When conducting case study research which addresses students with SSPI, it is of particular value to include direct observation as one kind of measurements. Direct observation, is not dependent on what people say about what is happening at that particular moment, which is considered by Robson (1993) as an advantage in using this technique. This approach allows the researcher to see the effects taking place and the individual responses made. Apart from that it permits the inclusion of relevant additional contextual information and allows the researcher direct access to what is happening and why it is happening.

Direct observation presents two major disadvantages; the relationship between the researcher and the case, and can prevent concerns related to data collection and recording. This role may go from a non involved observer to an extreme of assuming an integral part of the situation, being a participant observer. Between these two extremes there are certainly other appropriate possibilities.

In the case where the researcher is responsible for carrying out any kind of intervention, the role will unquestionably be very much as participant. This type of involvement will bring issues related to the subjectivity of the observations, which means difficulty in separating data collection from data analyses. Robson *(1993)* suggests that *"Analysis takes place in the middle of data collection and is used to help shape its development." (p.195)*. This is what really happens in case study research made up by cumulative interventions.

Observational data

Formal and informal methods are the two principal approaches to gathering observational data. Informal methods are characterised by the descriptive explanations as opposed to formal methods which are based on coded records.

The selection of which approach will certainly influence the analysis. The most formal or structured approaches, can be easier to analyse, although they require a critical sense of the data necessary to conceive the records.

On the other hand, according to Robson (1993), informal observations which include taking notes, daily writing about the situations and gathering relevant information from different sources can be more complex. Nevertheless, Miles and Huberman (1994) suggest, that even when using informal observation, some kind of structure is needed in order to avoid being overwhelmed with data, facilitating both the observation and the analysis.

2.6.6. Measurement and Data Collection

This section will discuss issues related to the process of data collection which are relevant to multiple single-case. It is commonly understood that this type of studies are using observations of a single case over a period of time, rather than looking to a

simple observation at one moment across many cases. The subject is observed before the intervention, usually over several occasions, and then continuously, or regularly, over time while the intervention takes place.

Establishing a baseline

When using a series of multiple observations, there is a need to establish a base-line, in order to provide a clear picture of the total situation. Before any intervention occurs this baseline will indicate all of the relevant factors concerning the subject(s) that may have any possible impact on the observations.

The baseline may be composed of descriptive information in regard to specific characteristics of the subjects involved in the research as well as serving as the basis for predicting the level of performance for the immediate future intervention. As stated by Kazdin (1982), in single case designs the possibility to predict is critical to this type of study. He further argues that *"it is reasonable to extrapolate the baseline findings into a continuation of the baseline, and that this projection is essential because "t serves as a criterion to evaluate whether the intervention leads to change." (p. 106).*

For this extrapolation to have any validity, observations or records covering an adequate time span are necessary to determine a trend. Arguments that the intervention caused an effect will be based, in part, on the variation between the trend of the predicted behaviour and the actual behaviour observed.

Chapter 3:
Research Design and Methodology

After reviewing the research methods used in the context of individuals with SSPI, in the previous chapter, this chapter will mainly presents the methodology used in this particular study.

It will give a brief overview in regards to particular issues related to the design of the study, followed by a description of the context in which this study takes place and the criteria for sampling selection. It will then presents the various types of data collection used in the study and some factors related to the analysis of data. A note about ethical issues finalises this chapter.

3.1. Design of the study

The study was conducted using a qualitative case study design. The case study was selected because it allows a holistic examination of the case, or phenomenon, and avoids separation of components from the larger context to which it was related (Jorgensen, 1989). Given the theoretical framework for this study, a framework based on the importance of the larger context in literacy and language learning, the case study was deemed particularly appropriate. It allow the researcher to examine the how's and why's of the interactive components in the contextual model of literacy and language learning.

The case study approach to the research was also taken because of the need for thick descriptions of the subject and surrounding contexts (Merriam, 1988). Thick description of the subject and surrounding context is particularly appropriate for these type of children, who could not demonstrate emergent literacy learning in traditional ways. Narrative descriptions of emergent literacy events, such as storyreading interactions were believed to be more sensitive than standardised tests in capturing their emergent literacy progress.

The study employed research strategies aimed at increasing the participation of the

individuals acting as subjects. The two strategies guiding this participation are collaborative research (Schensul & Schensul, 1992; Smulyan, 1988) and the participatory action research (Whyte, 1991).

Collaborative research, viewed as a tool for the empowerment of those groups with limited access to good data and the methods that produce good data (Schensul & Schensul, 1992), enables the researcher and participants, to work together in the naturally-occurring contexts with the goal of improving practice (Smulyan, 1988). Participatory action research, a research philosophy, allowed the researcher to be an active participant in the research process, instead of being a passive observer (Scherer & McKee, 1993). The collaborative framework and philosophy of participatory action research were applied to the project in two important ways:

- The researcher was an active participant in the study, providing direct instruction and technical assistance and consulting with the other team members and families.
- The goal was to benefit the subjects immediately and produce information that might, at a later point, benefit other students with severe disabilities and their teachers.

The study was designed to investigate an educational intervention among children with severe cerebral palsy, using AAC technologies and methods. Specifically, the researcher wanted to look at the following questions:

- Can AAC techniques be used to enhance participation by children with SSPI in story based activities?

- Does participation in story reading activities improve such pupil's opportunities to become "emergent readers"?

The design of the study was that, following a baseline assessment of each subject, interventions would be devised to provide opportunities for communication through

the stimulus of stories. Throughout these interventions observations on the use of AAC techniques by the subjects were recorded. Analysis of the observations were made to ascertain the children's participation in the story based activities when using AAC techniques. From these data indicators of any increase in the children's access to emergent literacy experiences and the extent to which the children demonstrate an increase in emergent literacy behaviours were identified.

In order to answer the research questions, the researcher decided to include two different, though related, components in the research design. The first component of this project addressed the lack of fundamental research about the use of AAC in educational contexts, contributing to more detailed, descriptive data about children with SSPI and their use of AAC technologies and methods. Therefore, in accordance with Crystal (1986), and other researchers in the field (Lloyd & Kangas, 1988; McEwen & Karlan, 1990; Brodin, 1992; Zangari, Lloyd, & Vicker, 1994) the researcher decided that for this component, a qualitative case study will be the best basic design.

The interventions and observations were carried out in the children's natural educational setting. It was considered important that the pupils were in the same setting so that interaction between the children as well as interaction with teaching staff would facilitated. Although the children would necessarily have very different characteristics, it was important to reduce the variables as far as possible. For this reason it was determined appropriate to ensure that the interventions were carried out in the same setting, presented by the same staff, and as far as it was appropriate, participated in the same types of story based activities.

Setting the project in a naturalistic setting enabled consideration of the factors related to learners' contexts which are especially important for children with SSPI (Koppenhaver et. al., 1993). There is a certain consensus in the literature that qualitative research designs are ideal for projects aiming for such multiple perspectives

(Brodin, 1992; Smith-Lewis, 1992) as well those interested in describing children's increasing learning and participation (Iacono, 1992c).

This ability to address and describe change allows qualitative and case study research design to address what Robson (1993) has termed clinical significance (when a specific treatment on an individual has produced a substantial effect).

Finally, as several researchers in the AAC field have pointed out (including Kraat, 1985 and Rowland, 1992), children with SSPI vary from each other to an even greater extent than other children in regard to their abilities, educational, psychological and medical histories. This inevitably compromises their representativeness, making the use of parametric statistics inappropriate. Therefore, the principal disadvantage of case study and other forms of qualitative research, their lack of generalizability, was judged to be of minor concern especially in view of the lack of basic descriptive data in the literature. Indeed, Rowland's (1992) review of the literature suggests that small 'n' studies are the norm in AAC intervention studies.

The second component comprised a subsidiary intervention to observe the introduction of similar story based activities in the home setting with a family member. The settings, modes of introduction, and method of intervention would vary between subjects in this element of the study, but it was considered that these additional data might provide insights into the children's awareness of the stories in other contexts and on the extent to which each child appeared to increase their emergent literacy behaviours. These data were gathered through interview with the family member and through video. The data drawn from analysis of the video was gathered using pre-established measures, which were considered to be of importance in developing emergent literacy skills (Blackstone 1989; McWilliam and Coleman, 1991; Moore & Kovach 1993; Light & Kelford-Smith, 1993; Light, Binger, & Kelford-Smith, 1994). This component was introduced, as one of the goals of this research project was a comparative evaluation of the intervention vis a vis similar studies, and reliability was

a preoccupation.

In summary, this study combines single case methodology (due to the diversity of the subjects) with some sort of group conclusions (due to some similarities in subjects and intervention strategies and goals). The aims are to investigate and discuss communicative competence in very young children with SSPI, and to evaluate interventions intended to increase such children's communicative competence during storyreading activities encouraging their emergent literacy skills.

3.2. Methodology

As previously discussed, when selecting a methodology, several factors have to be considered. These factors such as the selection of the subjects, the type of environment and the process of data collection are analysed in the next sections.

3.2.1. Subjects

The principle underlying sampling procedure was to select information rich cases which would provide plentiful, important data. It was assumed that despite their heterogeneity, they all shared characteristics which the research process would reveal. Then, armed with detailed data about each individual and the researcher's rich interpretation, the reader would actively process the results in order to decide for him or herself which clients are comparable to those studied.

The issue of sampling is not an easy one, since the type of children which this study addresses belongs to a very heterogeneous group. The selection of subjects to be studied at this investigation was in accordance with the following criteria:

- to have severe speech and physical impairments
- to have a chronological age between four and six years

- to have possible access to AAC and Assistive Technology
- to be at different levels of communicative competence
- to belong to the same classroom

Children were selected from those belonging to the classroom where the researcher was in charge, as a teacher. They all have severe speech and physical impairments (SSPI), and they attend the "CRPCCG" on a daily basis. Three of the children belonging to this group were selected to be part of this study, according to the criteria described above, and looking at the important factor that at the beginning of the study they were at three different levels of mastery, in regards to their ability to communicate and to actively participate in activities by the use of Assistive Technology.

3.2.2. Context of the Study

In Portugal the experience of integrating students with learning difficulties into mainstream schools has not always been an easy one (O' Hanlon, 1993). That goal becomes almost impossible when dealing with severe speech and physically impaired people. Until very recently, this population was often evaluated using very traditional methods, (Detheridge, 1996b), which left such people improperly classified and without any hope for improvement and development. The result was often the withdrawal of educational staff attention. Recently, however, Assistive Technology specifically designed for a severely impaired population has been introduced in our country, encouraging new outlooks on the part of education and rehabilitation staff, on the one hand, while also creating a need for new, adapted curricula (Azevedo, 1991).

The "Centro de Reabilitação de Paralisia Cerebral Calouste Gulbenkian (CRPCCG)" in Lisbon, is the main Rehabilitation Centre for Cerebral Palsy in Portugal. It was founded in 1960 by the Portuguese Cerebral Palsy Society (APPC), a private

Association, incorporated in 1977 into the State Social Security system. The Centre provides medical rehabilitation, special education, professional training and occupational activities for clients ranging from infants to adults. A multidisciplinary team composed of rehabilitation and paediatric physicians, physical, occupational and speech therapists, psychologists, nurses, social workers, kindergarten teachers, special educators and consultants (orthopaedic and neurological Doctors, rehabilitation engineer) give daily professional support to the clients. Rehabilitation efforts include client assessment, diagnosis and treatment with the goal of detection and prevention, in addition to supporting and guiding families aiming at educational and social-familiar integration.

Education is also an important concern and, in the pursuit of this goal, the Centre runs an Early Intervention Programme, Pre-school and Kindergarten classrooms and an Elementary School. These programs currently concentrate on very severely disabled clients who can not be included in mainstream school, or those who require a period of preparation before inclusion.

3.2.3. The Pre-school Classroom

The researcher has been the teacher in the Pre-school Classroom for the last 16 years at the CRPCCG. A group of six children with cerebral palsy between the ages of 3 and 6 attends this classroom on a daily basis. Speech will never be the main channel of communication for most of these children; consequently, they need a specially adapted curriculum where Assistive Technology and Augmentative Communication can play an important role.

The team in this classroom includes a full-time teacher and two instructional assistants, with the support of a multidisciplinary team including occupational, physio- and speech- therapists, a rehabilitation engineer, a psychologist, a social worker and a physician.

3.3. Intervention

The plan for intervention was mainly based on the use of storyreadings and AAC devices, in order to observe the possibilities of increasing children's participation. At appropriate points through the intervention, appraisals were made to evaluate the results to date, and any necessary modifications designed, conforming to the changing criteria design described by Kazdin (1982). These reviews informed the next phase of the intervention. The intervention was planned to have three phases.

Phase I - Familiarisation

In phase I, it was intended to start to maximize the child's natural modes of communication before focusing on the use of AAC techniques. Observations would look at interaction, communication, turn taking participation, issues related to children's self-esteem, as well as the their wish to take risks in participation, initiate and respond. A range of different books were planned to be introduced, giving a broad experience consistent with the emergent literacy experiences desired to promote children's enjoyment and pleasure. The plan set out to work within this design until children felt comfortable, secure and aware of these routines.

It was envisaged that this point would be reached at different times by each child, and that individual programmes would be required to develop the intervention appropriately from that point. The focus of observations is on interaction and communication and on familiarity with the activities of storyreadings to be presented at this phase. This phase was not intended to be developmental, but rather to establish a common practice shared by all the three pupils.

Phase II - Development

Phase II was mainly based in designing individual sessions, carried out by the researcher, to address the specific tasks and difficulties observed in each child. While

individual sessions were carried out by the researcher, group sessions, led by the teacher, would ensure the continuum of peer interaction. By continuing carrying out group sessions the procedures would be maintained, but by using a different adult they would be compensated for any overt personal styles of the "teacher".

Phase II was planned to focus on a limited number of stories, to be repeated to build familiarity with both the story and the vocabulary, according to King De-Baun (1990; 1994). These were adapted to use symbols which the child could use in connection with his communication system using both natural and aided techniques.

The goals expected for this phase were mainly related to an improvement of children's use of AAC, which include using appropriate symbol selection techniques and beginning to make use of symbols with a functional purposes. The aim at this point was that children would be aware of their capabilities concerning their independence in participating (like turning pages, etc.), improving skills such as auditory and visual comprehension, choice making, problem solving and decision making. These necessarily had to be done on an individual basis to meet individual levels.

Phase III - Consolidation

Phase III of the intervention would comprise group sessions as well as individual ones. Group sessions were intended to develop story retelling and discussion, continuing emphasis on peer interaction. These gave opportunity for observation and assessment of individual ability to predict sequencing of events in a story, to develop inferential skills and to confirm the acquisition of other capabilities demonstrated throughout the period.

Individual sessions were aimed at improving independent behaviours as part of the emergent and early literacy skills, which would be the basis for the development of reading and writing.

3.4. Formative Evaluation

The intervention enabled two types of data collection to be used. Contemporary notes were taken immediately after the sessions, and videos were made of these same sections. Because of participation, researcher would not be able to make detailed notes during interventions. Therefore, any loss of data control was compensated by video material used for reference.

Considering students' nonverbal behaviour in interaction as an integral part of the data it seemed appropriate, according to the studies of interaction researchers (Harris, 1978; Calculator & Dollaghan, 1982; Culp, 1982; Wexler et. al., 1982; Light, Binger & Kelford-Smith, 1994) to use videotape as an important source of data collection.

This method provided a high quality record including both visual and sound data. Furthermore, it relieved pressure on the teacher/interventionist, allowing her to give full attention to an individual or group of students. Finally, it preserved the events under analysis, providing for repeated observations which, in turn, permit tests of inter and intrajudge reliability. Records of observations were confirmed by the other adult present with the intervention "teacher".

Therefore, intervention was regularly videotaped throughout sessions. Only the transcriptions of pre and post intervention were analysed. Nevertheless, the use of video in the middle of the intervention process, allowed an alternative perspective to the researcher to act as non-participant observer, enabling more detached review of the observation.

3.5. Pre- and Post-Intervention Measures

This section will describe the process for intervention and data collection. It will describe the types of data to be gathered and will raise issues of reliability. Analysis of

these data will enable a comparison between pre-and post-intervention.

3.5.1. Background

The case study descriptions were enriched with additional information gathered from different sources. Informal interviews with parents were carried out by the researcher. They were mainly designed to collect information about children's communicative competencies and daily habits, and identify parent's main concerns and expectations in regard to their child's development. Previous knowledge of the families reassured veracity of information, which was also confirmed by the social worker in charge of the families.

Data was also gathered from the children's personal files in order to collect information regarding their developing profile which includes their physical and cognitive abilities, self-care and communication. Information on their previous access to AAC systems was considered particularly important.

3.5.2. Questionnaires

Two questionnaires were used with the parents. One gathered information about children's daily living experiences at home, their physical abilities, how they spend the time at home, likes and dislikes, and above all children's present communication status in regards to communicative functions and modes used. The other, adapted from the one used in the study of Light & Kelford-Smith (1993), was related to the home literacy experiences of the families and children, their attitudes and expectations towards literacy (see appendix 6).

3.5.3. Observation

Baseline data was also based on observations gathered by the researcher and the teacher in the classroom, over a period of three months prior to the intervention. Previous experience with the children was used to verify that these baseline data were typical. There were various adults who relate to the children at different points in the intervention who were refered to as "teacher" in this paper for simplicity. Therefore, this does not necessarily denote a particular profession in this instance. By using a variety of teachers, the effects of any one individual was reduced. Some of these observations were validated by confirmation from another "teacher" and were also confirmed by parents and other professionals.

In order to validate the qualitative observational data, a quasi-quantitative analysis was made of the video materials at pre-and post intervention phases. This covered video material both in the school and in the home. It will gather data on the modes of communication, frequency and content type, (e.g. requesting, predicting) and the balance between the partners in the interaction. Their progress related to the use of different AAC tools as well as the various factors related to the development of emergent literacy skills were considered for analysis.

To reveal more detail of the nature of the communicative acts taking place during the activities, the analysis was based on the communicative performance of the children according to the three main components of communication and language identified by Bloom & Lahey (1978), as to **use, form** and **content**, lately used by Bjorck-Akesson, Jonker, Heim & Mills (1994) and Clement (1995). According to these authors the content of communication and language refers to the thoughts the person wants to communicate (what?). As to the form, they include the means used for communication and the linguistic form (how?), whether the use is concerned with the function, that is the reason for communication as well as the learning of conversational rules (why?). During an ongoing and continuous process children learn to integrate the

three dimensions into language.

USE

Much of the previous research has indicated that interaction tends to be dominated by the adults. To gather information on the balance of communication between the partners, the interactions were refereed to establish the number of conversational "turns" by each partner. A turn was defined according to Light et.al. (1994), a single or a sequence of multiple communicative acts, separated by a pause of one or more seconds. In this sense if the gap is less than one second it is deemed to be part of the same turn, while pauses of over this denoted a different turn.

Although this definition of a turn would inevitably lack some precision, it was believed that it would give sufficient information for the comparative purposes intended. The sole intention for recording turns is to give an indicator of the balance between the partners, and to see whether there is such a domination in these interactions.

Communicative use is essentially related to participation patterns in conversational interaction, that is turn taking and rates of communicative acts. As already described, a turn may be composed of several communicative acts. In this case the analyses of the frequency of communicative acts was done in regards to the rate of communicative acts per minute, which gave a picture of the domination of each partner during the interaction.

FORM

With regard to the different types of communicative modes used by the children in this study, analysis was made by looking specifically at aided and unaided modes of communication. The variety of unaided modes observed were grouped into two categories: eye-gazing, facial and body expressions were considered one unit since they were most often used together, and vocalisations. Aided modes were considered

which include the use of graphic symbols for communication and the assistive technology to support them.

CONTENT

The principal data required concerned the communication content. Communicative content is intimately related to the quality of the communication in an exchange. In an effort to measure this essentially qualitative concept, the communicative acts of the children as well as the ones of the adults are categorised emphasising those considered more relevant for the emergent literacy development. These categories are in accordance with the work of Blackstone (1989); McWilliam & Coleman (1991); Light & Kelford-Smith (1993); Light, Binger & Kelford-Smith (1994); Moore & Kovach (1993). The children's acts are distributed among 14 categories and coded as follows:

- labels or comments; answers yes/no questions; asks questions; relates experience; predicts; off topic comments; asks to turn the page; asks to point to the pictures or to the text; asks to read the text by himself; fills in a word or a sentence; cued reading with the teacher; performs actions; unintelligible acts; others. (See Appendix 5 for coding descriptions).

The adults' communicative acts were classified according to 15 categories, from very simple acts such as reading the text, to those that promote the increasing of children's participation, like encouraging the child to read. They are coded as follows:

- labels or comments; yes/no questions; open-ended questions; relating experience; predicts; directives; off topic comments; confirmations/ expanding/ clarification; reads the text; encourages the child to read; simultaneous reading, provides support; points to symbols or words while talking or reading; repetition; others. (See Appendix 5 for coding descriptions).

3.6. Reliability

The baseline techniques described above were repeated in the same way in order to permit a possible comparison. For example parents responded to the same questionnaires used for the baseline, and interviews with them were carried out by the researcher. The interview discussion focused on expanding the questions in the questionnaires, and the researcher took care not to ask leading questions during the interviews. Parents again described the capabilities and difficulties experienced at home by their child, in respect to communication and emergent literacy skills. In addition the parents were asked to write a description of their observations during the period of intervention, in particular noting any signs of engagement with the reading and story telling events.

3.6.1 Intervention observation

Reliability was also facilitated by presentation of video to other professionals who were acquainted with the children, who could also verify that the observations were plausible, and who participated in discussion on the implications of the responses, with respect to the formative evaluation. In addition, video extracts were also shown to other professionals on a small number of occasions throughout the period, who were not actively involved with the children. These discussions corroborated the findings, but also revealed information on professional understanding of the use and implications of AAC techniques as can be demonstrated when looking at the Reynell's test scores (chapter 6) administered by different professionals.

The video material was also presented to the parents, who further corroborate the behaviours. This also enabled the parents to see the differences between the behaviours performed at school and at home.

3.6.2. Event occurrences

Because we know that communication behaviours are idiosyncratic and very difficult to accurately identify, stringent reliability on event occurrence demanded by positivist research approaches run the risk of ignoring some of the possible communicative attempts. By only taking events which are definite and quite obvious acts which may be significant would be ignored. There are also questions as to whether this positivist approach would be ethical in the present context. The principal difficulty in the reliability of these analyses is in determining what comprises a communicative act. Intentionality was considered a prime component. In the discussion of intentionality in chapter 2, attention was drawn to both intentional acts, where there was a repeatable and recognisable communicative gesture by the child, and to non-intentional communication where the communicative intent was imposed by the partner.

To reasonably ascertain whether a communicative act of this type has ocurred the researcher needs to be familiar with the subject, therefore objectivity is compromised. Reliabilty can be strengthed by the introduction of corroboration by others. When carrying out reliability measures there will be inevitable small differences due to the subjective nature of the review. To compensate for this, reliability measures were designed as follows and the results of it will be presented along with the data (chapter 6).

The reliability of these latter data is primarily dependent on the ability of the researcher to distinguish and correctly classify the numerous communication attempts occurring during each of those sessions. This is by no means a trivial task, and following similar procedures described in the literature (see, for instance, Light et. al., 1994), interrater reliability checks were undertaken on the classification procedures using two persons other than the researcher. Both these people were experienced professionals in the field of disability, familiar with the children's communicative behaviour and the teacher's pedagogical methods. Standardisation was addressed using the following training

process in the coding procedures:

1) The researcher and the coders first discussed the coding schedule, its design and structure. Then a small sample was completely scheduled by the researcher and the procedures used were explained to the coders. In addition, the coders compared the codes with the corresponding version of the videotaped interaction.
2) The coders next watched and independently rated a different segment of video. These results were presented to the researcher and discussed.
3) Finally, 2-minute segments were randomly selected from each of the 12 dyad interactions for the coders to independently evaluate. Twenty-four minutes of tape represented 14% of the 170 minutes observed by the researcher.

Inter-observer agreement was measured by calculating reliability coefficients according to Tawney & Gast (1984), the number of agreements divided by the number of agreements plus disagreements. The purpose of these quantitative data was to support the observational data increasing the reliability of any inferences which could be drawn. It is believed that the measurements taken were sufficient for this purpose.

3.7. Ethical Issues

Videotape recordings inevitably raise ethical issues. With this in mind, the researcher carefully explained to the parents the purposes of the study before asking their permission to videotape the children and to use the data for presentation in conferences and seminars. Parents were unanimous in appreciating the contribution that their children might make to furthering clinical knowledge, and thus in helping other children. Therefore, since the use of videotapes and photographs as data precludes any attempt at maintaining the children's anonymity, it was decided to use in this study the children's actual names and photographs, according to their parents official permission.

Chapter 4: Baseline Data

4.1. Introduction

This chapter presents background information regarding the children participating in this study. During the three months prior to this intervention, this information was collected either from the parents or from team members in the Centre. As already mentioned in section 3.5.1., these data was thus collected from:

- interviews with parents
- questionnaires to parents
- interviews with team members
- observations of the children in different classroom situations
- consultation of children's clinical files

This background information was concerned with the children's home environment as well as the school environment in which this intervention took place. The home environment information provided the researcher with data regarding:

- children's present communication status
- favourite activities, likes and dislikes
- parents' main concerns
- difficulties they experienced at home
- expectations concerning their children's future
- home literacy experiences

In addition, the information related to the school environment was collected at the Centre, either by consulting team members, or the children's clinical files. It was mainly concerned with children's physical and cognitive abilities, and their earlier educational experiences, with an emphasis on their previous access to AAC systems.

In addition to the data on each individual, information is also presented discribing the context of the intervention. It outlies the classroom environment and the daily routines in which the students participate.

4.2. The Subjects

The criteria for sampling selection has been previously explained in section 3.2.1. The three young boys who participated in this study had been diagnosed as having severe Cerebral Palsy due to anoxia at the time of labour and delivery. All children lived with their parents and attended the CRPCGG on a daily basis. Table 4.1. below presents a general portrayal of the three children.

Table 4.1: Characteristics of the three children

Child	Age	Gen.	Disability	Home Environment	Educational Setting
1 Nuno	5Y 10M	M	C. Palsy tetraplegic dystonic	Two parent family Two sisters: 14 and 3 years old.	Third year at Preschool classroom at the C.R.P.C.C.G
2 João	4Y 5M	M	C. Palsy tetraplegic/at hetosis	Two parent family No siblings (mother was pregnant)	First year at Preschool classroom at the C.R.P.C.C.G
3 André	4Y 6M	M	C. Palsy dystonic	Two parent family No siblings (at the beginning of the study)	First year at preschool classroom at the C.R.P.C.C.G. Two years at Early Intervention Program

All three children were totally functionally dependent on other people: they used manual wheelchairs which they were unable to move independently; they were unable to meet their basic needs (toileting, feeding, dressing, etc.) and they were not able to use speech for communication. Their speech problems were mainly due to: (a) poor respiratory control due to muscular weakness and other factors, (b) laryngeal and velopharyngeal dysfunction, and (c) oral articulation disorders resulting from restricted movement in the oral-facial muscles. None of the children were diagnosed having any visual or hearing problems, although some cross-eyed strabismus and lack of eye coordination movements had been identified in João's case.

4.2.1. Baseline prior to Intervention

Yorkston & Karlan (1986) define assessment as a process during which communication problems are identified and described and a systematic plan for communication intervention is designed or re-evaluated. In the case of individuals with severe speech impairments, assessment typically involves gathering enough information to make decisions about the need for Augmentative Communication Aids and Techniques and selecting communication interventions suited for the individuals' needs.

Due to the wide variety of motor impairments in individuals with cerebral palsy, their assessment and communication interventions require the involvement of a wide range of professionals such as occupational, physical and speech therapists, rehabilitation engineers, AAC specialists, doctors, etc. Initial information concerning the children was collected from the parents and other team members both through interviews and through reviewing some of the children's clinical files at the CRPCCG. During the initial interviews with the parents, an explanation about their children's involvement in this study was given to them, obtaining their permission and their wish in participating. The following detailed portraits resulted from the information collected during the three months prior to the intervention.

4.2.1.1. "Nuno"

Nuno's family comes from a low social economic level. Both parents are caretakers at a sports facility and they live in a small house on the grounds. The house does not provide adequate conditions for a child with a disability: access is very difficult for a wheelchair user, and it does not have a bathroom. Nuno sleeps in a double bed with his two sisters. A brief portrait of Nuno's Developmental Profile is represented in the following Table:

Table 4.2: Nuno's Developmental Profile

Nuno's Developmental Profile	
Physical	No sitting balance, very low tone in his trunk; requires orthotic device with lateral thoracic support, lumbar and pelvic stabilisation. Non functional movements in his upper or lower extremities, presenting a high tone that increases upon activity. Involuntary movements influenced by primitive reflexes and spasticity. Very poor head control, typically in foward flexion. Uses a neck rest support to inibit abnormal reflexes, maximising his visual skills.
Self-care	Totally dependent for dressing, eating and toileting. Independent in terms of toilet trained, however sometimes he uses diapers at home for mother's convenience.
Cognitive abilities	His cognitive abilities are below his chronological age. He has a short concentration span for learning activities, being distracted whenever something outside the activity happens. However he his alert, paying attention to events around him. His level of motivation depends on the activity presented, since he is very selective, only colaborating when he wants to, showing a very strong and determined personality.
Communication	He uses vocalisations, eye gaze, body and facial expressions as his primary modes of communication. Great discrepancy between his receptive and expressive communication skills. Reynell Comprehension Scale indicates an equivalent age of 2.02 years. At school he uses a PCS symbols communication book.

Use of AAC systems:

During his previous educational programme at the Centre, Nuno had benefitted from an AAC routine based program, demonstrating improvements not only in his communicative abilities, but also in developing the motor skills necessary to operate the variety of assistive technology used in the classroom. When he initiated this educational programme, at the age of three, crying was his primary mode of communication. He was not able to make choices between two activities or two objects. His communicative functions were mainly basic needs, like being thirsty, hungry, having pain, etc. He was able to show rejection, but had some difficulties in indicating a clear and understandable yes/no response for team members.

Using the buzzer as his first assistive technology, he began initiating communication, understanding cause-effect and how to get people's attention, which provided a change in his very immature behaviour. He used battery operated toys activated by a single switch, which not only offered him the experience of play but also served as a

reward for switch activation training. Group learning situations provided Nuno with opportunities to improve his participation, choice making, turn taking and anticipation.

The first PCS symbols provided to him were interactive ones and also related to the classroom activities he was involved in. Later, a vertical communication board (Etran) was provided so that he could select symbols using eyegaze techniques. During the year before the project, an effort was made to improve his communication rate and efficiency using a head light pointer for symbol selection which gave him access to a broader range of vocabulary. Constant attention was needed to maximize Nuno's ability to manipulate the technology. In the beginning, a switch was placed by his right hand, however, that proved unworkable as his hand was virtually non-functional. Another body site had to be found. In spite of rather poor head control, an attempt was made to activate a single switch interface (Jelly Bean from Ablenet®) fixed with a Mounting System Arm to the right side of his wheelchair, which he activated by using a lateral head movement to press the switch interface. However, this option was unable to provide consistent access to the switch due to Nuno's frequent changes of head position in response to extension and flexion as his head often moved from a tilted to a lateral rotation position.

By the third year at the Centre, an improvement in Nuno's communication had been identified: he was functionally using his symbols communication board with much more efficiency; he was persistent in his communication, and would not give up until he was understood by his communicative partners, being able to give additional information to clarify his message.

Home Involvement:

The situation at home was very different. Nuno's mother found a discrepancy between what he was able to understand and what he was able to express. In her opinion his receptive language skills were within the normal range for a child since, as she described, he regularly followed all adult dinner time conversations, even in the event

of family arguments. Although he has a symbol communication board, adapted to the home environment upon his mother request, she never mentioned its use. According to her information, he was unable to initiate conversation, to tell his family about things he had done at school or what had happened to him. He often interrupted when others were speaking and usually displayed distracting behaviour during conversations, a behaviour which his mother likened to that of his sister. Furthermore, he got very frustrated when people did not understand what he tried to communicate and most of the time he would give up.

Nuno's family found it difficult to collaborate with the Centre and to participate in their son's development. They appeared to interact kindly with Nuno, however, as they said, "everything has to be done in a rush." As a result, they did not have time to do what professionals at the Centre asked of them, or to play with him at home. He mostly spends his time on his own. The following Table 4.3. summarises Nuno's favourite activities at home, his likes and dislikes, as well as his parents' expectations.

Table 4.3: Nuno's Home Involvement

	Nuno
Favourite Activities	Watch TV(cartoons, soap operas and music). Watch his mother cooking or his sister doing school homework. Watch football practice at sports facilities. Has very few toys or personal belongings.
Dislikes	He especially dislikes his bath time.
Parental main concerns and expectations	Her son's future when both parents die. Hope he will learn to speak a few words and become independent to take responsability for his own life.

4.2.1.2. "João"

João comes from a medium-high social economic level. Both parents have university degrees. His mother is a high school teacher and his father works at the Ministry of the Environment. They live in a good flat, where João has his own pretty bedroom, full of toys and books. A brief portrait of João's Developmental Profile is presented in

the following Table:

Table 4.4: João's Developmental Profile

João's Developmental Profile	
Physical	Very little muscular tone, slightly increased during activity. He demonstates very low tone in his trunk contrasting with a higher tone in his upper and lower extremities. Non functional upper and lower extremities, making attempts to use hands to manipulate objects, demonstrating a left hand preference, able to perform a small left/right range of motion. Voluntary movements influenced by his spasticity combined with athetosis. Requires orthotic device for independent sitting, with lateral and lumbar thoracic support, as well as pelvic stabilisation for midline upright sitting position. Very poor head control, typically in a left tilted position, plus, occasionally, a forward flexion position. Uses a head rest with posterior and lateral support, to maitain an upright position, maximising his visual skills.
Self-care	Totally dependent for dressing, eating and toileting, although trying to colaborate as much as possible developing his independence. Independent in terms of toilet training.
Cognitive abilities	He seems to have very good potential for learning, although at this moment he is performing below his chronological age level. He can concentrate paying attention in learning activities for quite long periods of time, demonstrating an understanding of demands and a motivation to complete the tasks. However he appears to be a very insecure and passive child, rarely taking initiatives, not requesting or complaining.
Communication	He rarely uses vocalisations, and his eye gaze is very poor due to the tilted position his head normally presents. He mostly uses body and facial expressions for communication. He head shakes for "no" and moves his head forward flexion for "yes". Great discrepancy between his receptive and expressive communication skills. Reynell Comprehension Scale indicates an equivalent age of 3.02 years.

His family appears to be a happy, well-balanced one. Both parents were very calm, providing the time necessary to take care of João and to interact with him in a healthy way in many different activities, as can be confirmed on the following chart.

Table 4.5: João's Home Involvement

João	
Favourite Activities	Going for rides with parents, specially Shopping Centres, Hyper markets, restaurants, swimming with daddy. Visiting grand parents in the South of Portugal. Manipulating his toys, scribbling, painting. Listening to stories and seeing magazines.
Dislikes	He particularly dislikes any activity in which he is not able to participate, being relegated to an observer's role.
Parental main concerns and expectations	João's achievement of effective communication and independent mobility, are two factors which they found paramount to their son's development. Furthermore they expect him to make more friends and to learn to read and write.

They were available parents, always ready to collaborate with their son's rehabilitation team whenever asked to. They liked to come to the classroom to observe how their son was performing during daily activities. João's parents revealed their concern about the discrepancy between what he understood and what he was able to communicate. They commented that sometimes they were even surprised at what he was able to understand. His ability to make familiar people understand what he wanted to say was very limited, giving up in the presence of unfamiliar people. Nevertheless, his occasional frustration, when he was not able to make himself understood, worried his parents, who were already thinking ahead to how such frustration might increase in his future. João's socialisation, his happiness, and his ability to interact with his environment were referred to by his parents when proposing João for an AAC based intervention program .

Access to AAC Systems:

The speech therapist confirmed that João demonstrated a persistence of tonic reflexes during sucking and swallowing, and other immature oromotor functions, which precluded the development of intelligible speech. Furthermore, João's abnormal distribution of muscle tone, which resulted from pathological development of his central nervous system, interfered with coordination of respiratory, phonatory, and articulatory process. This information indicated that João should indeed be a future AAC user.

With regard to his communicative functions, João was able to greet someone he knew with a smile and an extension movement of his body. He paid attention to what his mother was doing and was also able to request attention as well as responding to yes/no questions. He demonstrated acceptance or rejection when something was offered to him, and indicated whether he wanted to stop or to continue a specific activity. He was able to make choices, request objects or activities within or outside immediate environment. Although he was unable to request information, he was quite capable of showing his frustration or displeasure when he was not able to perform

something he wished to do.

João's social skills were much more limited than his communicative functions. His mother related that he was only very occasionally able to initiate and maintain a conversation. He was not able to give clarifying information when people did not understand him, nor to ask questions, nor to take turns in the conversation. He often got distracted during conversations. He rarely communicated with his peers and was not able to wait his turn and, therefore, interrupted when others were speaking.

In order to enable João to access the AAC devices, the PCA checklist (McGregor 1992) was applied with the help of the rehabilitation engineer. Four key factors were identified as the main strengths and needs to be assessed for single-input control as demonstrated in Table 4.6:

Table 4.6: João's Access to Assistive Technology

Interface	
Body Part	Head
Site of the Body	Right Temple (lateral movements)
Type of Interface	Small Jelly Bean Switch from Ablenet
Location of Interface	Right armrest of his wheelchair, usig a Mounting Switch Arm

A communication board was provided for João's use, according to his physical and cognitive abilities, in order to enhance his communicative skills, as described in Table 4.7:

Table 4.7: João's Communication Aid

João's Communication Aid	
Format display	Communication book with several A4 pages. Pages were coloured according to the gramatical category of its symbols.
Symbols' presentation	4 symbols/page, 9 cm size, one in each corner for easier access.
Location	Wheelchair laptray, in a tilted position.
Selection Technique	Left arm, maintaining his hand in a closed position. (not very efficient)
Type of vocabulary	Interactive, related to classroom activities.
Vocabulary organisation	Grammatical organisation. Theme topic organisation.

João was integrated in this AAC based preschool program just two months before this intervention study began. He demonstrated considerable interest, participating in all the activities, becoming a more active child interacting with his environment.

4.2.1.3. "André"

André lived with his parents, both high school teachers, in a flat, where André had his own bedroom. His grandparents lived close by and provided considerable support to the family. André's parents collaborated closely with the Centre's efforts. They visited whenever necessary, followed their son's rehabilitation program closely, participated and made sure to follow team suggestions at home. A brief portrait of André's Developmental Profile is represented in the following Table 4.8.

Table 4.8: André's Developmental Profile

André's Developmental Profile	
Physical	He demonstrates very high muscular tone in his trunk as well as in his upper and lower extremities, both at rest and upon activity. He has non functional movements in his upper and lower extremities, which were furthermore influenced by primitive reflexes and spasticity. No sitting balance, requires orthotic device for independent sitting, with lateral and lumbar thoracic support, as well as pelvic stabilisation to facilitate his functional skills. Very poor head control, usually remained either in hyperextension or in a forward flexion position. A head rest support was recomended.
Self-care	Totally dependent for dressing, eating and toileting. Initiating a toilet training program.
Cognitive abilities	According to his last team, he shows a limited potential for learning, functioning well under his chronological age level. His concentration span is very short, easily giving up before completing the tasks. He immediately gets distracted whenever someone comes into his eyesight. He presents very immature behaviour, although he appears to be a very interactive and alert child, always observing things around him.
Communication	He communicates with his whole body. His facial and body expression is very rich. He uses vocalisations, and eye gaze. He smiles for "yes", opening his mouth with a spasm. He stays very quiet for a "no", which sometimes is difficult to identify. There is a discrepancy between his receptive and expressive communication skills. Reynell Comprehension Scale indicates an equivalent age of 2.04 years.

Both parents, especially his mother, interacted a lot with André. They regularly talked to him and explained what he was seeing or doing. For example, she described that during toilet time and dressing, they would always verbalise the names of related

objects and actions in order to provide him with as much information as possible. His mother characterised him as an intelligent, attentive and happy boy who got frustrated when his physical challenges prevented him from doing something. His favourite activities at home, and parental expectations are summarised in Table 4.9. below.

Table 4.9: André's Home Involvement

	André
Favourite Activities	Loves to go out with his parents, to the coffe shop and the Supermarket. He enjoys having stories read to him, listening to music, watching TV, and talking about his toys with family members. Favourite toys are those which involved movement.
Dislikes	He specially dislikes those ocasions in which his father watches TV football games or reads the newspaper.
Parental main concerns and expectations	André's functional capabilities and future needs are their main concerns. Their greatest wish is André's independent communication, whether using symbols or computers. Learning to read and write, as well as making friends are also within their expectations.

At the beginning of the project, Andre's ability to communicate at home was very limited. Although he understood well what people said either in conversation or in play, his mother noted an inability to make others understand him, especially those outside the family. As a result of this significant discrepancy between his comprehension and his ability to express himself, he often became frustrated.

André's mother described his communicative functions as being limited to the following functions: giving yes/no responses; greetings and goodbyes; keeping his partner's attention; getting people's attention; and making requests only in the presence of their referent. Occasionally he managed to initiate a conversation, failing however, to maintain it or to give additional clarification when necessary.

Access to AAC Systems

In the early intervention program, André had been taught to use PCS symbols, using eye gaze for selection. Symbols would be placed in his horizontal laptray with sufficient space between them to allow André to find them and manage to select them with his eyes. At home he had a symbol communication board given by the early

intervention team, which according to his mother, he was not able to use in a functional way, although recognising the symbols. André's mother's principal goal at the time of the intervention was the improvement of his ability to use symbols in order to communicate effectively.

At the beginning of this study, André's new team decided to re-evaluate his positioning in order to improve his functional skills, searching for a better switch interface location. Results of this evaluation, according to the PCA checklist are presented in the following Table 4.10.

Table 4.10: André's Access to Assistive Technology

Interface	
Body Part	Head
Site of the Body	Right Temple (side rotation movements)
Type of Interface	Small Jelly Bean Switch from Ablenet
Location of Interface	Right armrest of his wheelchair, usig a Mounting Switch Arm

The new team agreed that eyegaze continued to be André's best option for symbol selection, while trying to move to an Etran to hold the symbols as described in Table 4.11. below. The possibility of using a head pointer or a lighted head pointer was considered, although the previous team found it hard for him to accept the use of objects on his head.

Table 4.11: André's Communication Aid

André's Communication Aid	
Format display	Etran Frame. Communication book to initiate a light pointer selection training.
Symbols' presentation	6/8 symbols, 5 cm size(Etran Frame). 4 symbols/page in the communication book to train a light pointer selection..
Location	Vertically attached to his wheelchair laptray.
Selection Technique	Eyegazing. Using a light pointer or head pointer selection (to be initiated).
Type of vocabulary	Interactive, related with classroom activities.
Vocabulary organisation	Grammatical organisation. Theme topic organisation.

4.2.2. Home Literacy Experiences

This section presents the results of the home literacy experience questionnaire (adapted from Light & Kelford-Smith, 1993) completed by the parents in the begining of this study. The purpose of this questionnaire was to provide the researcher with information regarding the physical and functional contexts, the language contexts and the cultural contexts of these children home literacy experiences. An idea of their family literacy experiences and how they promote their child's literacy development at home, was also identified with this questionnaire.

These children's parents reported home literacy experiences similar to those found by the original authors of the survey. All three were very interested in literacy related activities (reading and writing) and their mothers reported reading to them daily in the case of João and André and seldom in Nuno's case. André and João had literacy materials at home including their own storybooks and other regular models of reading and writing. Nuno did not have his own storybooks, nor did his family read regularly themselves. When they did read to him, they reported reading the TV guide "because of its colours".

André and Nuno usually paid less attention during reading activities than João. The first two mostly listened to the story and looked at the pictures, while João tended to be much more involved, turning pages, pointing to the pictures in the book, and answering yes/no questions. Although they all greatly enjoyed writing activities, only João engaged in these activities 2 to 3 times a week. Nuno and André seldom participated in writing activities such as scribbling and drawing. These results support the hypothesis that children with physical disabilities are more dependent on others in their environment to provide them with access to reading and writing materials than their nondisabled peers. The following Tables 4.12; 4.13; 4.14. summarise the results of the parent's answers to this questionnaire:

Table 4.12: Summary of the Home Literacy Experiences Questionnaire, by Nuno's Parents

Nuno	Reading Experinces	Writing Experinces
Child's interest	greatly enjoys	greatly enjoys
Frequency	rare	rare
Child's behaviour	listening	watching
Adult's behaviour		
Children's Materials	none	pens, pencils and crayons
Adult's Materials	TV guide and sports' magasine	pens, pencils and crayons
Parents' use of literacy	rare	rare

Table 4.13: Summary of the Home Literacy Experiences Questionnaire, by João's Parents

João	Reading Experinces	Writing Experinces
Child's interest	very much	greatly enjoys
Frequency	every day for 5/15 minutes	2 or 3 times a week
Child's behavior	listen, pointing to pictures, answering questions, turning pages, etc.	scribling, writing his name with adults' help.
Adult's behaviour		
Children's Materials	many childrens' story books	pens, pencils, crayons and paints.
Adult's Materials	all sort, from encyclopaedias, to romances, newspapers, advertisements, etc.	pens, pencils, and computers.
Parents' use of literacy	very often, to accomplish different tasks (work, amusement)	very often, to accomplish different tasks (work, amusement)

Table 4.14: Summary of the Home Literacy Experiences Questionnaire, by André's Parents

André	Reading Experinces	Writing Experinces
Child's interest	greatly enjoys	greatly enjoys
Frequency	every day for 20 minutes	seldom
Child's behaviour	listen to the story and pointing to the pictures.	
Adult's behaviour		
Children's Materials	many childrens' story books	pens, pencils, crayons and paints.
Adult's Materials	varied from encyclopaedias, to romances, newspapers, advertisements, etc.	pens, pencils, and computers.
Parents' use of literacy	very often, to accomplish different tasks (work, amusement)	very often, to accomplish different tasks (work, amusement)

4.3. The Environment

The goals of an AAC based program for these children with SSPI in the pre-school classroom include: providing a learning environment in which all tasks and experiences are meaningful to the child; promoting children's access to independent communication and independent participation; encouraging the young people's active participation in curriculum activities; ensuring the accessibility of language during each activity to facilitate the children's non-speech communication. In order to meet such goals, the classroom has been fully "engineered" in accordance with strategies available in the literature (Goossens' et. al. 1992, Musselwhite, 1993 and King DeBaun, 1994), to enable children with SSPI to better interact with their environment.

4.3.1. Engineering the Environment

Great care was taken to surround these children with a rich language environment. Symbols and technology, for instance, were accessible everywhere; the walls were covered with pictures, graphic symbols and printed words. Goossens', Crain, & Elder, 1992, states that when children are immersed in such rich environments, they are encouraged to interactively communicate, enhancing the development of verbal and non-verbal communication and establishing the foundations for literacy.

Mayer Johnson's Picture Communication Symbols (PCS) was the graphic system used in all activities. Its symbols were displayed on various communication boards, specially designed for each activity and intended encourage the children's successful use, so that they might make an impact on their learning environment.

Classroom materials were always placed in the same place, within the children's eyesight, so that they could refer to them or indicate what they wanted to play with either by pointing or simply by looking (eye gazing). As a result, children were able to

mentally organise their space, to feel secure within it, and could express their wishes. It is thought that by getting their wishes met the children would feel understood, which, in turn, would increase their self-esteem and their self-confidence encouraging them to initiate in further communicative utterances.

Technology was always accessible and was completely integrated into the learning process. All activities were intended to increase the children's levels of participation and understanding. Two Macintosh LC Computers and a Style Writer Printer were available in the classroom, in addition to the Ke:nx Interface. In the absence of any synthesised speech in the Portuguese language, Macaw II and Switchmate systems using hardware and software functioned as voice output devices. A more detailed description of the assistive technology used in this project is given in a Glossary.

4.3.2. Daily Routines

Children need to understand what is happening around them. When they do not understand such events, how they are organised, how they interrelate and how they follow one upon the other, young people often become distracted or scared. (King DeBaun, 1993, 1994). When children with SSPI understand their environment, and especially, when their time is organised for them in a familiar way, they are better able to behave themselves appropriately. A minor change in their daily routine can negatively affect these children's behaviour and learning ability. It is, therefore, extremely important for students to learn to identify, look forward to, and anticipate their daily activities.

A communication board was specially designed with symbols informing children about their daily schedules. This board included sequences of symbols representing the child's activities and their chronological order; as a result, the students were able to talk (with the team or to their parents at home) about school activities as well as their preferences and needs. The ability to organise their time helped the children to

understand what was expected of them and created a sense of confidence about their capabilities. "Circle time," was a set routine organised at the beginning of each day. It involved a greeting such as a good-morning song using augmentative music. The particular song was specially designed to practice name recognition, choice making, self-esteem, and peer interaction. On the wall, there was a symbol calendar and a symbol weather display, which represented the choices and the communications of each child during the activity.

Other activities included augmentative music sessions in which the children were taught to sing songs together (using song boards made of symbols matching the song to devices). During this activity children were able choose which role they wanted to perform using pre-recorded voice output devices. Story time was another activity in which children were engaged in events such as story reading, telling or creating, through the medium of symbols and technology. Adaptive cooking (using graphic-based recipes) and adaptive games were among other programmed activities.

The participants' interaction patterns were judged to be another crucial aspect of these learners' environment and special attention was given to educating speaking partners about effective interaction strategies, and promoting an awareness of the demands faced by nonspeaking children, despite the lack of effective teaching tools for such efforts.

Family was considered an essential player in the learning process. Thus, efforts were undertaken to train family members to communicate with their children, to pay attention to their requests, and to answer their communicative attempts. Throughout the intervention, the researcher nourished a productive relationship with the parents by helping them to feel at ease and encouraging their participation.

This program was designed to emphasise the pragmatic aspects of augmentative and alternative communication interaction, that is to say, the integration of form, content and use of AAC systems.

Chapter 5: Intervention

5.1. Introduction

"No child is too young, too physically disabled, or too cognitively impaired to participate in literacy events"

Pierce, et. al., 1993

Children without physical disabilities are spontaneously able to speak their thoughts, act out their ideas, scribble, and read their "writings" aloud. On the contrary, many children with multiple disabilities have limited literacy experiences. They have difficulty developing understanding of written language and demonstrating the knowledge they have acquired.

In order to address the literacy needs of children with SSPI, this project attempted to provide these children with emergent literacy experiences not unlike those of their non disabled peers. Narrative texts with pictures were used to introduce children to stories. Written words and pictures were paired with symbols to represent the story characters, actions and events. Comprehension was enhanced through experiential play, such as dramatisations, role playing, and puppetry.

A variety of low and high-tech AAC devices combined to allow the children to interact, answer questions, comment, role-play, retell stories, practice early story writing and generate novel utterances.

This chapter is addresses what is considered to be the central work of this study, which is the intervention itself. It describes:

- strategies and approaches used within activities
- children's increasing learning and participation
- created materials used for the purposes of this intervention

This descriptive analysis was collected by the use of videotape techniques during the

six months of intervention. This method of data collection, discussed in Chapter 3, gave the researcher the opportunity to review observations of the sessions in order to be able to plan subsequent interventions, modifying or adapting them according to the children's performance.

5.2. Criteria for Selecting Story Books

King DeBaun (1993) has identified two types of books according to the way and the goals they are used for: "Books for Learning" are those selected for repeated readings, serving as the core of the theme. They provided the topics for communication, language learning goals, shared reading experiences, and literacy related extension activities. "Books for Enjoyment," on the other hand, enrich the curriculum, help develop world knowledge and support the current book for learning. However, these books were not offered for multiple readings, unless specifically requested by students.

For this particular intervention, books for learning were chosen (according to King-DeBaun, 1993) to promote early communication and language learning to the children participating in this study. Selection criteria included large text lending itself to choral reading using AAC systems. In some of the books, part of the text was deleted, while in others the text was slightly changed.

Repetition and simple graphics easily depicting familiar concepts and contexts were also taken into consideration, enhancing children's comprehension. In addition, books with story-specific vocabulary and friendly text related to the children's life experience were thought to more easily encourage AAC users to be interactive and participative. Furthermore, stories were choosen as being fun, capturing students' interest, and capable of generating activities which improve their participation and learning development.

Finally, prediction was also taken into consideration when selecting the books for this study, since the ability to predict is considered by many experts to be very important to the child's cognitive development; therefore, this question will be analysed later in this study. In conclusion, the stories used in this study contained interactive and repetitive vocabulary, simple graphics, and simple text, and illustrations depicting actions and concepts familiar to the children. These stories were selected to promote students' fun and enjoyment regardless of their ability.

5.3. Description of the Intervention

This intervention study was designed to evaluate AAC approaches to promoting literacy in this group of children. During six months, (January to July), the researcher visited the classroom twice a week. During each visit (from now on called "session") the researcher and children engaged in story reading experiences or related activities intended to develop the emergent literacy skills, serving as foundations to conventional literacy. The researcher selected teaching and learning styles for intervention that were student empowering and life-enhancing.

Chapter 3 presented a summary of the three phases planned for the intervention. Each of the three phases were developed during a number of sessions either on an individual basis or with children working as a group. Table 5.1. illustrates the quantity and the type of sessions, which were dependent on the goals drawn for each of its section according to each child's level and capacities.

Table 5.1: Intervention Frequency Chart: Number and Type of Intervention per Child

	Nuno	João	André
Total Individual Sessions	16	14	16
Total Time (minutes)	268 min.	305 min.	268 min.
Mean/session (minutes)	16.8 min.	21.8 min.	16.8 min
Total Group Sessions	22	22	22
Total Time (minutes)	530 min.	530 min.	530 min.
Mean/session (minutes)	24 min.	24 min.	24 min.
Total of Sessions	38	36	38
Total of intervention/time	798 min.	835 min.	798 min.

Individual sessions lasted approximately 20 minutes each, depending on the child and his performance on that specific day, while group sessions lasted approximately 25 minutes. Each child received approximately 14 hours of intervention throughout the six months.

During sections, efforts were made to minimise the video camera's influence. For example, a light sensitive camera usually operated from a fixed position, eliminated the need for extra personnel. Although the use of video can, at times, cause some alteration in children's behaviour, two aspects of this study led the researcher to discount this disadvantage. On the one hand, the children in this study were accustomed to the presence of technological equipment, the video camera being just another piece of equipment. Furthermore, video had been frequently used in the classroom during the previous five years. The taping of all intervention sessions during the six month period, their subsequent description and analysis were complemented by the researcher's field notes at the end of each session.

Phase I- Familiarisation

This phase attempted to teach the children the pleasure of books (Burckhart, 1993), an important emergent literacy skill, and to get children to realise that books are full of wonderful things which can be enjoyed and shared with adults and with their peers. They were allowed to choose the books they wanted to be read in order to cultivate their enjoyment and delight in story reading interactions.

This phase of the intervention comprised in group sessions organised to introduce the children to the first steps of emergent literacy acquisition. Several different story books were used.

At this level children were exposed to emergent literacy concepts without actually being taught a specific lesson, developing a broader appreciation and understanding of literacy. Children should also understand their potential participation during the story, like turning pages from right to left (assisted by the researcher) and learning the concepts of print such as reading print from left to right.

Children were encouraged to realise that the print or picture on a page was controlling what was being read to them. The concept of the word itself –that a word has a meaning and that the blank spaces between the words do not– was of equal importance to these emergent readers. The relationship between print and speech (grapheme-phoneme) is very important in building both understanding and expression of oral and written language.

To improve their independence, they were allowed or assisted by the researcher to turn the pages of the book. All of them improved their participation and understanding that they could control this mechanism of book reading by various means, such as eye gazing the lower corner of the right page, and in João's case, by making a small arm movement to signal his intention to turn the page or to point to pictures.

All three children demonstrated their enjoyment of book reading by asking "more" (the

continuation of the activity), looking at the bookshelf at the end of each session, and by showing their happiness as soon as they understood that the session was to start.

In group sessions, developing interaction and simple turn-taking routines was essential to the communicative behaviour. The children learned to attend to their partners' behaviour and then, on cue, fill their turns with related behaviours while their partners attended to them.

This phase allowed the children to experience as much success as possible in literacy activities, designed to encourage their continuation and enhance their positive self-image. The students were especially interested in performing physical actions, contacting the book by looking, pointing or turning pages.

During these two months only Traditional Orthography was used in the story book. Augmentative communication was gradually provided so that they might begin to associate some symbols with their functions (e.g. the symbol for "turn the page"). Thus, the researcher began using modelling strategies either by pointing to the symbols on her communication vest, graphically depicting her verbal language or by using the child's communication board, modelling his action. The initial symbols selected were mainly for interactive use, (turn the page; guess what; oh, no!; do it again; let me see; etc.).

Access to voice output devices was provided at the last session of this phase. There was just one simple message recorded for each child in different manners (may I read; let me read; I want to read). This allowed them to play an interactive role at any time, to improve their level of participation. Every time a child used the voice output device to ask to read, he was provided with pre selected symbols in the Dial Scan, which he was selecting according to the page being read, enhancing his independent reading skills.

In conclusion, the goal of this phase was to enhance the students' enjoyment in book

reading. When the activity had became routine and pleasurable, the following phase was gradually begun, at a rate each child could handle.

Phase II- Development

This phase emphasised the use of AAC systems and assistive technology to improve children's independence and participation during sessions. Individual sessions were designed for this second phase, taking each child's specific skills into account.

Multiple or repeated readings of the same story were presented in order to facilitate children a greater understanding of its concepts and ideas. Noris and Damico (1990) state, that in this way children enjoy the opportunity to become familiar with the story vocabulary and welcome the opportunity to "show off" not only their newly learned vocabulary but also their ability to "pretend read".

For the first time in this intervention the text in the book was presented to the child not only in a printed language format, but also in a symbolic language format. Symbols were chosen to represent the major vocabulary and mounted on each page of the book, as demonstrated in Photo 18 (Appendix 1).

The symbols were either used to point out the main story concepts (photo 24) or they served to mediate the children's reading process (photo 26). The use of a scaffolding approach helped the researcher to ensure the students' comprehension of materials while avoiding materials and tasks that were too difficult for them to experience success.

The researcher used a cued reading approach when reading the story wherein the words and symbols are touched while reading. Key concepts were highlighted by pointing to the symbols on her communication vest display, while verbalisation occurred in complete sentences.

The child learning to speak constantly has role models for speaking. Therefore, the

individual learning to use a communication aid should also have the benefit of role models using communication aids. The researcher used an "aided language stimulation technique" (Goosens', Crain & Elder 1992), modelling the interactions expected in children's book reading by highlighting the main points of each story page on a communication display.

These individual sessions were mainly designed with activities that worked on comprehension tasks and decoding strategies thought supportive to the literacy development. After the story was presented to the children, each of them was individually engaged in literacy related activities. Symbols in the Dial Scan were provided enabling them to retell the story by selecting the symbols in the correct sequence which required a decoding of the meaning of the page. Symbol selection was cued by the interventionist repeating back to the child a segment of the storyline as a verbal prompt.

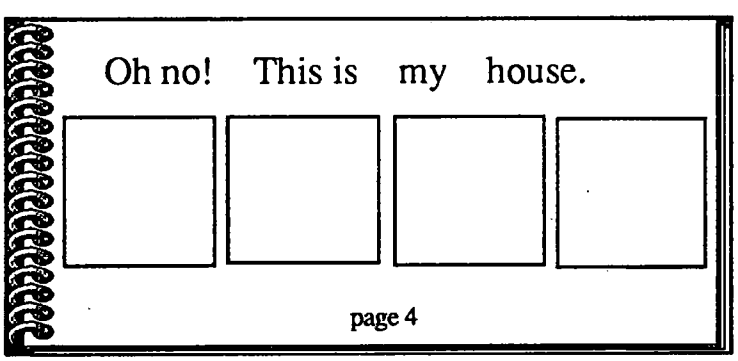


Figure 5.1: Children's Story writing book before symbols were selected by them

In this phase children were initiated to "story writing". Children were provided with their own book presented only in written text and blank squares (see Figure 5.1.).

On the front page could be read: "*This is the story of Little Duck, written by* .....(child's name and date)". Children were asked to select the symbols corresponding to the sentence presented on each page, and paste them in their own story book; thus they "pretend to write".

The child's symbol sentence was read aloud by the interventionist (helping him to point to the symbols as they were being read) exactly the way the child sequenced them. This gave the child an auditory comprehension of the sentence he was writing while also identifying possible errors in its construction, without producing any negative feedback from interventionist.

The semantic process was both auditory (comprehending the words) and visual (sequencing the symbols to organise the sentence), a combination which allowed the child to internally process the language. In this manner children were working on choice making (choosing the appropriate symbols), on problem solving (organising them in a correct sequence), and on decision making skills.

Depending on their ability level, different symbol selection techniques were provided for the children's use. André and João used an Etran Frame (Photo 19) for eye gaze selection. Nuno used a Dial Scan for automatic circular scanning selection. The final product of their work (the book) was sent home to be shared with parents. When parents read the child's own book aloud, they were contributing not only to their understanding of the functions of writing, but also to their children's motivation and self esteem. Children need to develop a sense of ownership in reading and writing in order to actually become readers and writes, (McLane & McNamee, 1991).

During the individual sessions, the other two children were observing each other's performance. This factor was a very positive influence in their behaviour, since they were "learning" what they were supposed to do, by watching the others do it, anticipating what they were going to perform afterwards.

Phase III- Consolidation

Phase III was the final phase of this intervention, which lasted approximately two months. For this part of the intervention two story books, "Little Piglet" and "How do I Put it on?", were adapted to be used in multiple readings.

Story 1: "Little Piglet"

As the following description indicates, this story contained simple, understandable vocabulary as well as several repeated lines (e.g. "Oh, no, Little Piglet. This is my food") and a very predictable sequence of events, encouraging the children's anticipation and participation.

Table 5.2: Sequence and vocabulary presented in Story 1, for Phase III

	Story 1: Little Pink Piglet		
1	Little Piglet escaped from his pen.	6	"Oh, no, Little Piglet. This is my food!" said Mrs. Cow.
2	I'm so hungry! said Little Piglet. I'm going to look for some food.	7	Little Piglet visited Brown Pony. "Yum, yum. I like oats!" he said.
3	Little Piglet visited Mother Hen. "Yum, yum. I like corn!" he said.	8	"Oh, no, Little Piglet. This is my food!" said Brown Pony.
4	"Oh, no, Little Piglet. This is my food!" said Mother Hen.	9	Look! The farmer had brought some apples for Little Piglet. He thought about the other animals.
5	Little Piglet visited Mrs. Cow. "Yum, yum. I like hay!" he said.	10	"You can share my apples with me," said Little Piglet.
		11	"Thank you, " they said. "You are a very nice pig."

Just as in previous books, materials were carefully created for this story for different purposes, including the addition of symbols to the printed text on each page (Appendix 1: photo 18). The same symbols were copied and individually pasted on grammatically colour-coded cards (Fitzgerald Key) for independent use (Figure 5.2.). They were laminated and Velcro was stuck to their backs so that they could easily be used with any communication aid.

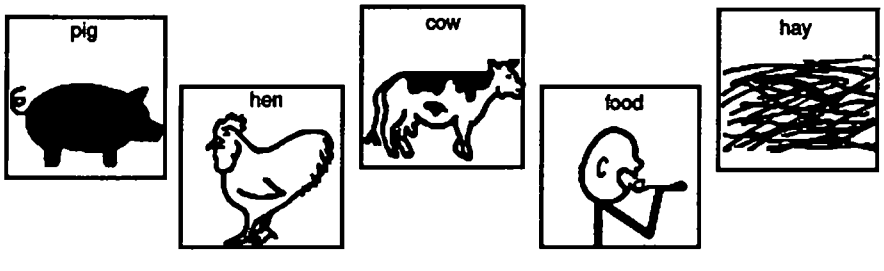


Figure 5.2: Examples of Individual Symbol Words.

Symbol sentences were also created using selected key symbols for symbol sentence's construction (photo 27), as in the following examples.

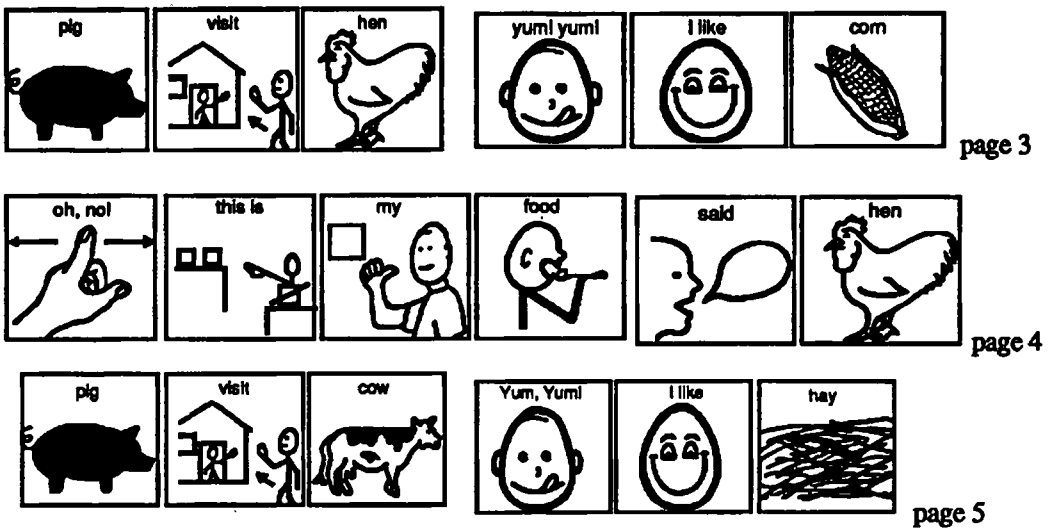


Figure 5.3: Examples of Symbol Sentences according to each page of the book.

The children first heard the story in group sessions to familiarise themselves with it. At the end of each session, they took part in a story discussion about events and characters in the story.

Props and real objects further enhanced the story and greatly motivated the children. The props, for example, included representations of the four characters in the story made of coloured card which were placed on each child's tray. In addition, real corn, hay and oats were actually provided for them (Photo 20)

The next sessions were intended to stimulate the children's participation and to promote peer interaction. After the story was read to them with the book, each child used eye gazing to choose which animal (hen, cow and pony) he wanted to perform in retelling the story (Photo 21). The researcher played the pig's role, since it had to move around the other animals. The children were then presented with real food which the "pig" would ask for.

Before acting the story out, the children received a description of the food and its attributes. Moreover, the children's participation was improved by providing each of them with access to the repetitive line of the story (Oh, no! Little Piglet. This is my food!) (Photo 24).

The group then acted the story out with the researcher playing the pig, always waiting for children's signs in order to make sure that they were anticipating who "Little Piglet" was going to see afterwards. Thus the children developed inferential skills and an understanding of the story's sequence.

Acting out the story provided children with a meaningful opportunity to develop cognitive skills essential in literacy acquisition such as choice making, discrimination, identification, concept learning, classification, rule learning, and problem solving (learning new combinations and applications for previous learned rules) which are considered to be top priorities in the process of literacy acquisition (Blackstone, 1989). It also helped them not only to maintain their attention and interest during longer periods (25 to 30 m.) but also to improve their peer interaction and mutual help since they were helping each other to recognise their turns.

For AAC users, interactions with peers who also use AAC systems offer them the potential to interact on an equal footing with each other, and to develop social relationships. However, AAC users often lack the social and linguistic competence to initiate, maintain, and develop peer interaction. Therefore, other group sessions were organised to promote peer interaction, in which the children asked each other questions using the Macaw II, and the Cheap Talk (Photo 22, 23, 25).

Three different overlays were created to be used with the Macaw II which corresponded to the linguistic content of the story to improve children's social communicative competence. Overlay 1 and 2 appear in Figure 5.4., and each one held four recorded messages. The first one presents the symbols of the four animals while the second one presents the symbols of the food they ate.

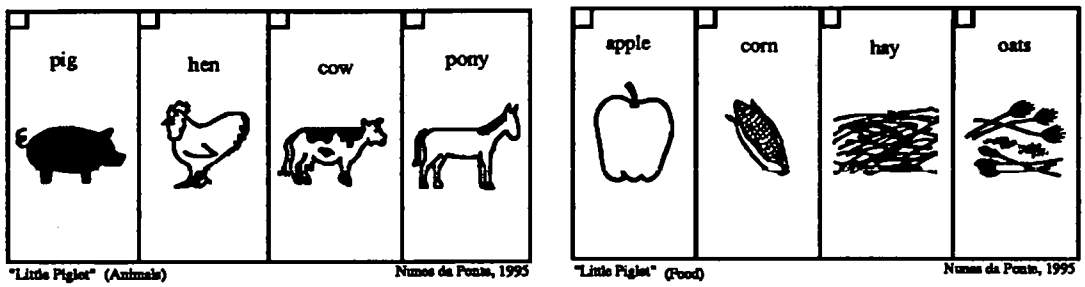


Figure 5.4: "Little Piglet" Macaw Overlay 1 and 2, with 4 messages

Using Macaw II and step by step scanning the children were able to "talk" about events in the story (photo 23 and 25), while the researcher modelled communicative utterances. Over time her role was progressively reduced to improve children's communication and she became more and more of a mediator as she relinquished the responsibility for, and the control of, the conversation.

On the other hand, the children were gradually led to interpret the text, and more complex ways of looking at it were introduced. They could retell the story by looking at the pictures in the book and selecting symbol words or symbol lines previously provided by the researcher. This allowed them to work on comprehension tasks and decoding strategies which are supportive to literacy development.

Independent book reading was also considered important for the development of literacy skills. Cutting (1989) holds that, for children at the emergent reading stage, the emphasis should be on reading books and behaving like a reader from the very first day.

Individual sessions were then developed to improve children's independent reading, giving them the opportunity to retell the story they had heard, either by using the Macaw II (Photo 26), or the Dial Scan ((Photo 27). The book was presented to the child who pretended to read it by selecting a symbol sentence, corresponding to the page presented. Both the printed text and the symbol sentence selected were simultaneously read aloud while the researcher pointed to its words and symbols while reading.

Sentence activities work mainly with selection and sequencing. Extended activities were developed to further increase children's syntax and pragmatics, using systems which allowed for the sequencing of two or more symbols to complete the sentence. Simulating early-reading-like behaviours children would access the vocabulary appropriate to the story one symbol at a time, further increasing the use of syntax and pragmatics aspects of language development.

King DeBaun (1993) states that story telling can also lead to writing because children are combining information in sequence which is what writing is about. She further argues that opportunities to explore and use writing tools and a variety of objects and materials for sharing experiences and ideas are the beginning roads which facilitate risk taking, creative and independent learners.

Opportunities for children to attempt to write and to explore the meaningful and enjoyable creation of written language were provided, using this story as theme. For this purpose, and since these children are not yet at a level of using letters, they used symbols placed on easily programmable computer keyboard emulators, with Ke:nx interface. Two literacy-based setups were designed to train writing using Ke:nx Create which provided aural and visual feed back (speech digitised, printer, graphics). Ke:nx Create works much like a word processing program that permits users to design setups to look, act and sound a certain way. Figure 5.5. shows Ke:nx Setup 1, presented exactly as it looked in the computer screen for the children in this study.

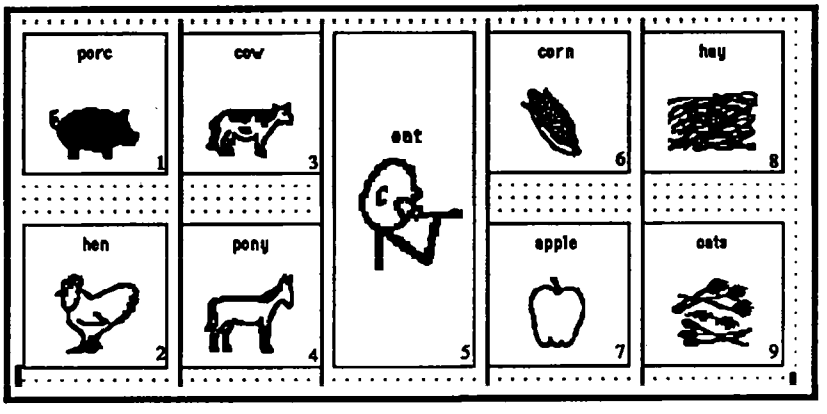


Figure 5.5: Computer Screen with "Little Piglet" Ke:nx Setup 1

In Setup 1, a scanning window including 9 areas appeared on the screen, each area represented a different function. When a child pressed a switch the scanning array appeared on the screen and Ke:nx began to highlight the lines of items. When the desired item was highlighted, the child pressed the switch and the character, mouse function, command or speech phrase was sent to the computer, as described in the chart below.

Table 5.3: Computer Functions with "Little Piglet" Ke:nx Setup 1

Look (symbol)	Sound (digitised speech)	Act (printed text)
1	Little Piglet	Little Piglet + space
2	the hen	the hen + space
3	the cow	the cow + space
4	the pony	the pony + space
5	eats	eats + space
6	corn	corn + space
7	apples	apple + space
8	hay	hay + space
9	oats	oats + space

This way children used scanning techniques to write anything they wanted without any pressure to produce correct sentences. First, they were asked to choose whatever animal they wanted, then the action (eat), and afterwards any food item, creating their own sentences. Immediate positive feedback was provided by the researcher reading it aloud, even when funny sentences were created. Moreover, at the end of the session the product of their work was printed out so that they might begin to make the connection between writing and reading. Thus they began to realise that print can have a meaning understood by many different people on many different occasions.

To increase the number of choices available to the children and to lead them to begin using syntax to construct sentences similar to those in the story book, Ke:nx Setup 2 was created (Appendix 2). This Setup 2 was found to be far too complex for João and André who lacked Nuno's experience as technology users. It was, therefore, decided to introduce another story (Story 2) which presented easier and interactive activities, as a balance between motor development training to access technology devices, and

educational instruction as necessary.

Story 2: "How do I Put it on?"

Since the last story had been found too difficult for computer writing activities, a new story was carefully thought out for this important part of the intervention. Story 2 was selected specifically because of the simplicity of its vocabulary and the predictability of its plot which encouraged children to participate more through story extension activities, such as story retelling, story construction with puppetry, reading and writing.

As in Story 1, materials were created to improve children's participation, independent reading and writing. These included: symbol words and sentences from the story; Macaw II overlays; puppets to encourage creativity, and much more as can be seen in Appendix 1(Photos 28- 41). The vocabulary and the sequence of events in this Story are demonstrated below:

Table 5.4: Sequence and vocabulary presented in Story 2 for Phase III

	Story 2: How do I put it on?		
1	This is my shirt	12	I put my cap on my head.
2	Do I put it on like this?	13	These are my shoes.
3	No!	14	Do I put them on like this?
4	I put my shirt over my head	15	No!
5	These are my pants.	16	I put my shoes on my feet.
6	Do I put them on like this?	17	Here goes...
7	No!	18	Shirt.
8	I put my legs through my pants.	19	Pants.
9	This is my cap.	20	Cap.
10	Do I put it on like this?	21	Shoes.
11	No!	22	I'm ready. Off I go!

A few group sessions served to introduce the children to the story. During this period the students engaged in as much peer interaction as possible while the researcher served as mediator. Next, the children retold the story in group sessions using a Teddy Bear and real clothes to recreate the story (Appendix 1: Photo 40, 41). To do so, the children would select a clothing symbol on an Etran or the Macaw II and were

immediately reinforced by the researcher who interpreted the child's initiation and helped him to put the same piece of clothing on the Teddy Bear.

Using Switch Mate, one of the children would work the repetitive line ("Do I put it on like this?") whenever the Bear was putting it on wrong. Children enjoyed this story from the very beginning. They were never bored acting out the story with puppets which reinforced concepts and ideas about it.

Puppets played a key role in modelling interactive communication and also served as facilitators when more complex tasks were proposed. In André's case, for example, due to his lower ability level the Teddy Bear waited for him to say what to put on. André was encouraged to select symbols in the Dial Scan in order to construct a sentence. He then received reinforcement when he saw one of his colleagues put the requested piece of clothing on the Teddy Bear (Appendix 1; Photo 38, 39).

Before new computer-assisted writing experiences were introduced using the Ke:nx and since children with SSPI require extensive motor training to learn to use scanning techniques effectively, a simpler and more motivating writing approach was used. Five specially designed mini-books for writing allowed these children to read/write some of the sentences from the story. The text was presented both in printed and in graphic symbols format as demonstrated in Appendix 3. Each symbol was presented inside a frame serving as a clue for children's understanding, in the presence of a blank frame, what symbol they should select to complete the sentence. The vocabulary presented in each of the five books (Table 5.4.) was the same, only the tasks changed.

Table 5.5: Vocabulary contained in the Five Mini-Books

1	This is my shirt	2	I put my shirt over my head
3	These are my pants	4	I put my legs through my pants
5	This is my cap	6	I put my cap on my head
7	These are my shoes	8	I put my shoes on my feet
9	Here goes: shirt, pants, cap, shoes	10	I'm ready. Off I go!

Each of the books was prepared at a different requirement level, as can be identified in Appendix 3, and was used with each child according to his rate and development. In each case the child selected the symbols required for each page using different scanning techniques such as eye gazing with an Etran frame, or Dial Scan.

In Mini-Book 1 the children were asked to fill in the blank space by selecting one of the symbols in the sentence presented. In book 1, only the symbol representing the clothing was missing in the sentence for children selection, while in Mini-Book 2, the blank space could represent either a piece of clothing or a part of the body.

In the case of Mini-book 3, the children were asked to fill in either one or two blank spaces in each sentence. Both symbols for clothing and body parts were missing. Thus the children began to relate the piece of clothing to the body part where it belonged; furthermore, by placing them in the correct position they worked on syntactic skills.

Comprehension and decoding tasks, were the goals of Mini-book 4. Each page presented a printed sentence with a totally blank space above it. Complete symbol sentences were provided separately from the book and the children were asked to fill in the blank with an entire sentence, according to the page read aloud by the researcher. Sequencing and composing were the tasks of Mini-book 5. Each page presented a printed sentence together with three or four corresponding blank spaces. The children had to fill in the blanks one by one by selecting symbols from a left to right progression according to the page read aloud by the researcher. When the children were comfortable with this task, according to his own rate and ability, they were asked to do similar tasks, but this time using the computer to select the symbols. Ke:nx Setup 3, was created so that the children could select a symbol to fill in single word blanks on worksheets. They were designed to allow children to work on semantic tasks, understanding the sequence of the sentence and completing it with a "missing" word. A few examples of the computer worksheets created for this study follows:

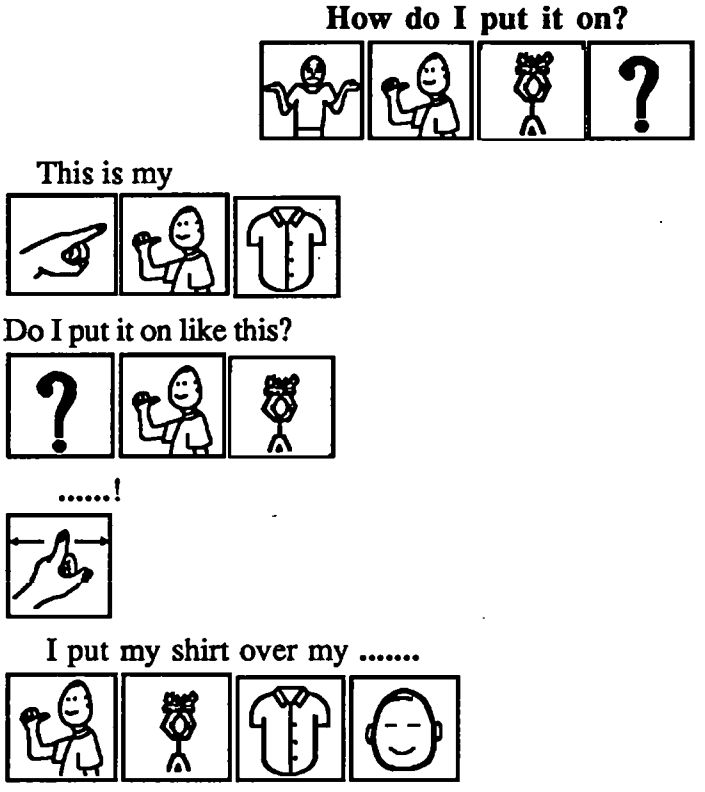
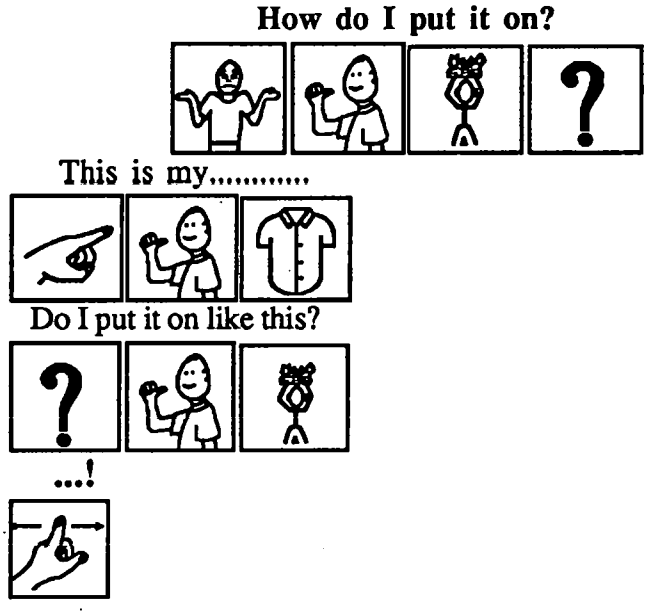


Figure 5.6: **Computer Worksheet 1 as presented in the Screen for children to fill-in-the blank.**

Both print and symbol formats were presented in these worksheets. In worksheet 1 only one word was missing, while in Worksheet 2 two words might be missing in the same sentence.



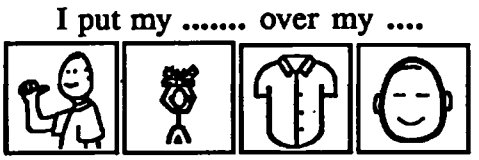


Figure 5.7: **Computer Worksheet 2 as presented in the Screen for children to fill-in-the blank.**

These two groups of worksheets allowed the children to pretend to write by filling the blanks with the missing word. Ke:nx interface made it possible to select a symbol on the computer screen and write a printed word on the worksheet, as demonstrated in Appendix 2 (Ke:nx Setup 3).

All the children were much happier with this approach. It was an easier task for them since they only had to select between a maximum of two items per column out of a total of 10 items. In addition, the students were able to independently delete and/or print what they had written. Ke:nx Setup 4 (Appendix 2), was used with Nuno, since he was the most advanced child in this study. By selecting four symbols in the correct sequence, the child would write more complex sentences such as: "*I put my shoes on my feet*".

5.4. Post-intervention session

The time allotted for this intervention study was drawing to an end. An individual session for each child was now in order to get a post intervention evaluation which would allow the researcher to compare with the children's baseline session. Each child was involved in story reading using the same story, already familiar to all of them, since it had been used for the last two months. They used familiar materials such as the book they were used to manipulating and symbol words and sentences which they accessed viã eye gazing on an Etran or by a Dial Scan.

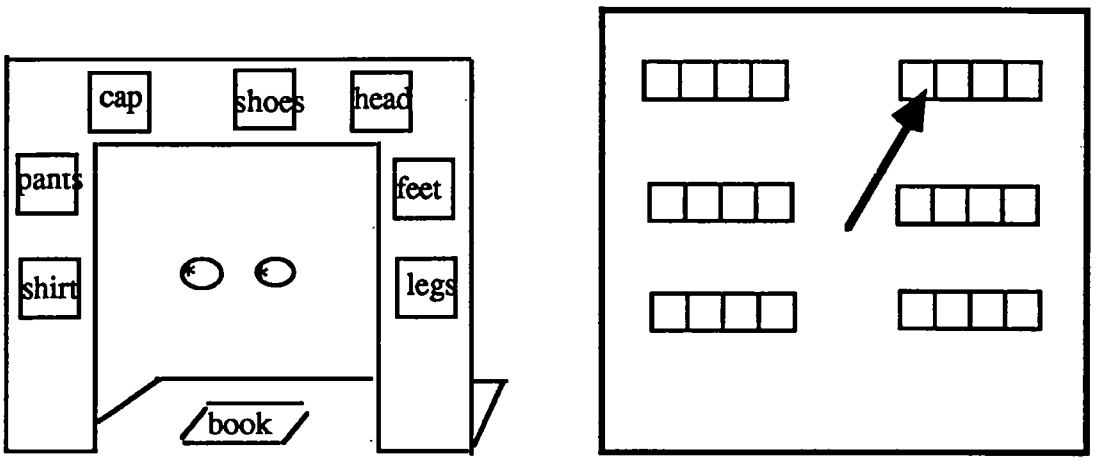


Figure 5.8: **Etran Frame and Dial Scanner containing story specific vocabulary presented in Symbol Words or Symbol Sentences (Photo 32)**

However, new "generic" vocabulary was provided for use either by the researcher, who modelled the appropriate response using her Communication Vest, or by the child. This vocabulary (Figure 5.9 and 5.10) was specially selected to enable children to anticipate, to "read" independently, to fill-in using symbols, to relate with their own experiences, to ask to turn the page, and to comment on the book. More important than everything, it was the first time children ever had access to it.

In the case of Nuno and João generic vocabulary was provided by using Macaw II (Figure 5.9. below),while story specific vocabulary was provided by using the Dial Scanner (Figure 5.8. above).

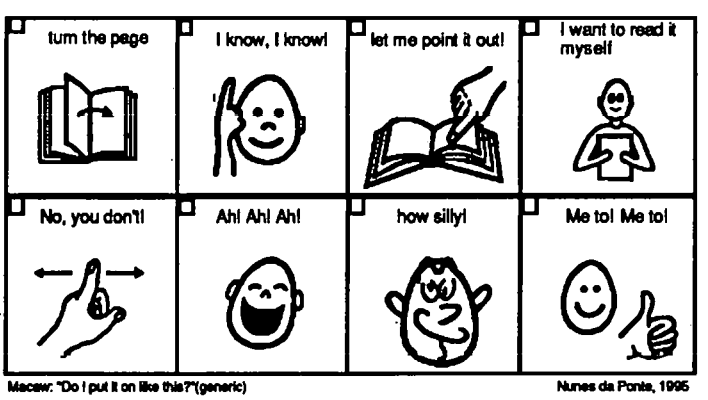


Figure 5.9: **Macaw II Overlay: "generic" vocabulary recorded in complete sentences.**

In André's case, an Etran with symbol words (Figure 5.8), together with the Dial Scanner with symbol sentences and a Switch Mate to ask to turn the page were considered adequate for his ability level. The researcher modelled the generic vocabulary for him by using her communication vest (Figure 5.10).

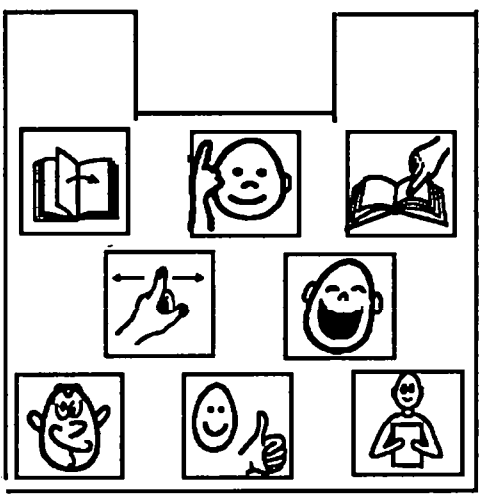


Figure 5.10: **Communication Vest: "generic" vocabulary presented in Symbol Words.**

It was easy to verify in this session that the children were aware of what they were able to do as they were spontaneously able to use the generic vocabulary for real purposes, intervening during the interaction. It was also noted that by the end of the six month intervention, the teacher's role was more that of a mediator who modelled appropriate responses and always reinforced children's responses and expanded upon their efforts.

Children demonstrated that they could now read the text by themselves, since they were encouraged to do it along this intervention. They appeared to feel as successfully participators, demonstrating a wish of independence in their reading process. Table 5.6 below represents children's performance in "reading" the pages of the book at the last session.

Table 5.6: Performance of the three children in reading the book pages either by selecting simple symbol words or complete symbol sentences.

		N	J	A
1	This is my shirt		x	x
2	Do I put it on like this?			
3	No!		x	
4	I put my shirt over my head	x	x	x
5	These are my pants.		x	x
6	Do I put them on like this?			
7	No!		x	x
8	I put my legs through my pants	x	x	x
9	This is my cap.	x	x	x
10	Do I put it on like this?			
11	No!		x	

		N	J	A
12	I put my cap on my head.	x	x	x
13	These are my shoes.	x	x	x
14	Do I put them on like this?			
15	No!			
16	I put my shoes on my feet.	x		x
17	Here goes...			
18	Shirt.	x	x	x
19	Pants.	x	x	x
20	Cap.	x	x	x
21	Shoes.	x	x	
22	I'm ready. Off I go!			

The children did select the correct word or sentence to match with the book page without errors in the case of Nuno and with only one error in the case of João and André. It is interesting to remark that João was the one that took more risks in selecting the sentence or the word to match the page, even before it was turned over. It can be concluded by observing Table 5.6 that children were able to correctly "read" 46% of the book pages in the case of Nuno, 64% in the case of João, and 55% in the case of André.

As Koppenhaver, Coleman, Kalman, & Yoder (1991) have stated, the issue is the functional use of literacy. They assert that literacy development is best nurtured when reading and writing are used to get something, to accomplish a goal. This intervention was designed to provide as much enjoyment as possible. Since, as Musselwhite (1993), has pointed out, when interventionists are not having fun, it is not likely that students will be either.

It was hoped that by encouraging activities which allowed for active participation in developing concepts of written language, these interventions were able to increase these children's awareness of the printed word and foster enjoyment and satisfaction.

The focus should be on the process of experimental learning rather than on specific products. Students ultimately control the information provided, the support offered, and the language content, form and use modelled, based on their interest, input, and responses.

Chapter 6: Post-Intervention

6.1. Introduction

"People with disabilities put up with a lot of measurement in their lives. Teams of medical personnel swarm over us at regular intervals recording our every deviation from the norm. This is often done in a setting that is so cold and impersonal that it affects our ability to respond as well as we can to the test at hand. My mother once invited my paediatrician, a woman who specialised in the care of disabled children, to lunch at our house. As the meal concluded and I started to do my things, the doctor was amazed at what I could do in my own milieu. After that luncheon encounter, she never treated me the same way in her office again."

Michael Williams (1995)

This chapter presents a description of the data. The principal data, gathered through observation during the intervention, is supported by the background information gathered from parents and professionals both before and after the intervention. These data are qualitative.

As well as pre-and post-data gathered from intervention and questionnaires, video records were made of story reading interactions of each child both at school with the researcher and at home with the mothers. These videotapes were fully transcribed in order to be further analysed. These data are quantitative, and serve to complement the principal qualitative data.

6.2. Qualitative Results

Just as at the beginning of the study, post intervention information was collected through interviews with the Centre's professionals as well as with the children's parents. These data together enabled the researcher to consider whether the intervention had possibly contributed to gains in emergent literacy capability, and further, to conclude whether any such gains were reflected in behaviour changes in the home.

6.2.1. Nuno

According to the professional team at the Centre, Nuno achieved most of the goals designed for him during the school year. He showed, for instance, great improvement in his ability to participate in more complex classroom activities, managing to finish them without becoming distracted or de-motivated. He demonstrated the ability to anticipate events and to understand their sequence. His ability to identify his own printed name as well as those of his classmates indicated his capacity to memorise information. He furthermore showed consistency in his responses.

Unfortunately, a post-intervention interview with Nuno's mother provided limited relevant data. She did, however, confirm that Nuno had improved considerably during this school year. His interest in communication had constantly increased and he persisted in trying to communicate whether at home or in public, even with people he did not know. He was now able to participate in other children's play, and to pay attention for longer periods of time when someone was talking to him.

His favourite activity at home was when his sister would read stories to him. In turn, his sister (who is 14 years old), appeared to become very interested in her participation in the study. She enjoyed it and was willing to come to the Centre whenever her presence was requested.

Nuno's speech therapist applied the Reynell test to him once again. The following figure presents the child's Verbal Comprehension Scale results at the ages of 3 years 9 months, 4 years 9 months, 5 years 9 months and 6 years 3 months, respectively. The two last ones correspond to the beginning and the end of this study.

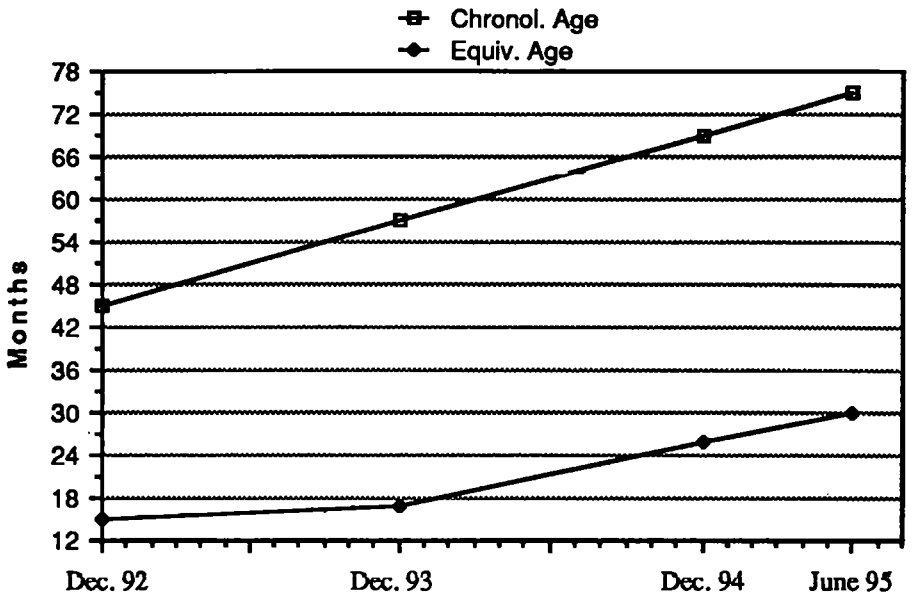


Figure 6.1: **Equivalent age on the "Reynell Verbal Comprehension Scale" obtained by Nuno, compared with his chronological age.**

Some factors have to be taken into consideration when looking at these scores. Firstly, Nuno and the therapist had never worked together previously, she was not used to Nuno's method's of communication, nor was he comfortable with the test setting, which was a completely new and unusual situation for him.

Although fig 6.1 would suggest that Nuno's progress was in line with that made prior to the intervention, the therapist was of the opinion that despite the above ratings, Nuno demonstrated much greater consistency of response, an increased attention span, richer communicative content as well as an improvement in his vocabulary and his general knowledge.

6.2.2. João

João had a baby sister in the middle of this study, a fact which appeared to be of importance when analysing the changes in his behaviour. His mother indicated that by the end of the intervention he was better able to answer to a large variety of yes/no questions. At times, she reported, he expressed sadness and/or frustration, both of

which increased in proportions, especially on those occasions when he was not able to get his messages across to others or when he was unable to do something he wanted to do. Furthermore, his mother testified to an increase in João's expression of his feelings; he liked to be cuddled by his family, and he was demonstrating a much stronger sense of humour.

In addition, his comprehension abilities had improved considerably and although the discrepancy between his passive understanding and his productive communication still existed, he had become able to "talk" about things that had happened to him, or which he was involved in during the school day.

When he was not understood he did not give up, but was able to give additional information to try to resolve the communicative impasse. His mother reported marked improvements in João's ability to communicate with his father who was now able to understand a much wider variety of communicative acts than six moths before.

João's mother declared that the major change in her child was that he had become much more exacting. He had become very demanding, knowing precisely what he wanted, and was no longer willing to accept the first thing offered if it was not what he really wanted. He had also become more active, more able to play with other children and to interact with people besides those most familiar to him.

Contributing to these new social abilities was his increased knowledge of how to wait for his turn during play without interrupting inappropriately. He enjoyed talking to people on the telephone, not only to his grandparents as he had previously done, but to anyone who called his parents. He would make varied sounds on the phone pretending to talk to them about different things.

Although João's mother stated that she did not use his symbol communication board, which she found very limited and unsuited to his home communicative needs and interests, nevertheless, by the end of the program she had become more comfortable

with the amount of her child's utterances that she was able to understand. At this point in time João's parents continued hope that the boy would further progress in developing his communicative capacities. He now had a little sister whose abilities were a constant challenge to him. In fact, her presence appeared to motivate him to initiate communication, to produce more sounds, to play with her and to increase the speed of his performance.

As to the storybook that was sent home to be read to João, his mother commented on several important issues. First of all he immediately demonstrated a higher enthusiasm when she showed him the book and proceeded to demonstrate his familiarity with the story. She noticed that João was able to predict what was going to happen and that he participated more than when she read unfamiliar books, in which case he became more expectant.

In addition, his mother found that the combination of symbol format and text helped both her and João in the reading process. She was surprised to discover how such very simple stories could be so interesting for children as opposed to more complex stories with more information, complicated texts, pictures and events.

As a result of her participation in this study, she concluded that his performance was much more enhanced when the same story was read to him over and over again. She witnessed a greater interest and participation on his part, commenting *"He seemed like he was reading too"*.

Professional opinions echoed those of João's parents. At school, as well as at home, João's performance had greatly improved. He had become a much more active child and much more aware of his own abilities to perform suggested tasks. He regularly demonstrated his capacity to make choices, make decisions and to solve problems. He had come to understand turn taking and had otherwise improved his peer interactions and as a result he was demonstrating a much positive self image.

The following figure presents the results of Reynell Verbal Comprehension Scale test results which were obtained when João was aged 3 years and 7 months, 4 years 5 months, and 4 years 11 months respectively. The last two correspond to pre and post-intervention times.

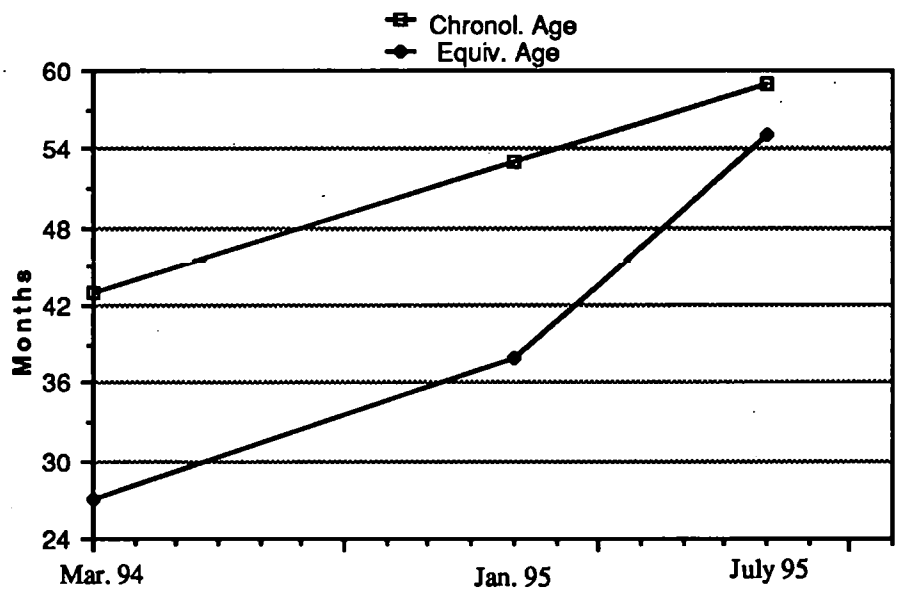


Figure 6.2: **Equivalent age on the "Reynell Verbal Comprehension Scale" obtained by João, compared with his chronological age.**

The results clearly demonstrate the dramatic improvement in João's receptive language abilities throughout the intervention and corroborate his parents' opinions.

6.2.3. André

In a post-intervention interview with André's mother, she described significant generalised improvement in her son. She considers that his improvements are as much related to his behaviour, as they are to his cognitive abilities. In particular, André demonstrates a much longer concentration span, being able to perform specific tasks and showing his interest in them.

For example, André's attention span had increased significantly, which allowed him to

perform more tasks and demonstrate his interest in them. In addition, his mother had noticed an improvement in André's social skills. She reported his ability to take turns in interaction had improved, while he was also able to spontaneously request objects or actions outside his immediate environment. All of these changes had contributed to more frequent play with other children, and in all-round better quality peer interactions.

André's mother described a considerable improvement in her son's communication ability at the end of the six month period. He was more able to initiate, maintain and pay attention to conversations. However, his mother remained concerned with the enormous frustration the boy still demonstrated when his attempts to communicate or to manipulate objects were unsuccessful.

As to this particular study, André's mother was further pleased with the enhancement of the quality of her interaction with her child. This improvement led her to want to increase the time they spent in story reading activities. Above all, his mother felt that her expectations about her son's abilities related to story reading activities had increased, which she expected would be reflected in his performance.

Many of his mother's opinions were equally supported by the professionals at the Centre. His very immature behaviour at the beginning of this study was now becoming more and more appropriate to his age level. He was able to perform more complex tasks with greater motivation and for longer periods of time.

André's Reynell test scores appear in Figure 6.3 below and demonstrate his Verbal Comprehension Scale results, obtained with tests applied at the ages of 3 years and 8 months, 4 years and 8 months, and 5 years and 2 months respectively. The two last results were obtained just before and after the intervention.

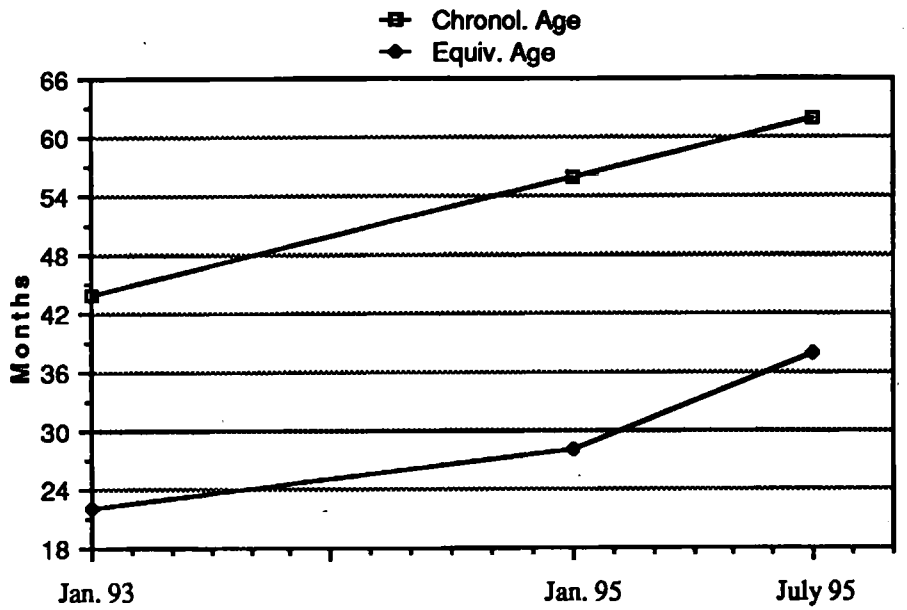


Figure 6.3: **Equivalent age on the "Reynell Verbal Comprehension Scale" obtained by André, compared with his chronological age.**

According to the speech therapist, André demonstrated important improvements in his test performance concerning his attention span as well as his interest and involvement in the task itself. Nevertheless, he still remained dependent on the adult's positive reinforcement. In contrast to his initial assessment, he now appeared to be very attentive, observant and very persistent, not easily giving up on his tasks.

6.3. Quantitative Results

Quantitative data were generated by videotape analysis of both pre and post-intervention sessions of story reading, either with researcher at school or with mothers at home. The purpose of this analysis was to yield comparative data with which to test the two research questions presented in chapter 1, which form the basis for this investigation:

- **Can AAC techniques be used to enhance participation by children with SSPI in story based activities?**

- **Does participation in story reading activities improve such pupil's opportunities to become "emergent readers"?**

In order to address these two questions, the communicative competencies of the children were analysed, according to Bloom & Lahey (1978), as to form, use and content, and their progress related to the use of different AAC tools .

In relation to "form", communicative acts were classified according to different means, such as eye gazing, facial and body expressions, vocalisations and AAC aided communication.

As to the children's "use" of communication, differences between children's and adult's turn taking participation during interactions, and the weight of each type of communicative act in the overall interaction were analysed. It should be pointed out here that the definition of conversational turn is a controversial matter, and there is no universally accepted definition, as pointed out by Buzolich and Wiemann (1988). In our study, turn was taken as intentional behaviour directed towards the partner, separated by pauses of one or more seconds (Light et al., 1994). Thus turns might include a single communicative act or multiple communicative acts produced in sequence without a pause between them.

Finally, children's communicative "content" was analysed by coding all the above referred intentional communicative acts directed towards the partner (mother/teacher) as to their function in the interaction.

As well as the controversial nature of defining a turn there are problems in distinguishing between acts which have intentional and non-intentional communicative purpose. This has been discussed in chapter 3, section 3.5.3. These difficulties must be born in mind when reviewing the following data. However, reliability measures described later in the sections 6.3.4 were introduced to compensate for such difficulties.

6.3.1. Classification by Category Coding System

Children's and adults' communicative behaviours during the story reading interactions were classified according to a category coding system. Separate coding categories were developed for mother/teacher and for child communicative acts, emphasising those considered important for literacy development. The coding systems used were adapted from previous publications about story reading interactions and literacy development (Blackstone, 1989; McWilliam, & Coleman, 1991; Light & Kelford-Smith, 1993; Light , Binger, & Kelford-Smith, 1994; Moore & Kovach 1993).

The coding system for the children's communicative behaviour includes the following categories: labels or comments; answers yes/no questions; asks questions; relates experience; predicts; off topic comments; asks to turn the page; asks to point to the pictures or to the text; asks to read the text by himself; fills in a word or a sentence; cued reading with the teacher; performs actions; unintelligible acts; others. (See Appendix 5 for coding definitions).

The adults' communicative behaviour coding system includes the following categories: labels or comments; yes/no questions; open-ended questions; relates experience; predicts; directives; off topic comments; confirmations/ expanding/ clarifications; reads the text; encourages the child to read; simultaneous reading, provides support; points to symbols or words while talking or reading; repetition; others. (See Appendix 5 for coding definitions).

6.3.2. Data on Child/Teacher Interactions

Six videotape recordings of story reading sessions, collected both in January and in July, (pre- and post- intervention), were fully transcribed by repeated viewings of them. All intentional communicative acts directed towards the partner were analysed and coded according to the category coding systems presented at the previous section.

For each child's interaction with the teacher, the data so collected are presented in five different types of tables:

- The first type (tables 6.1, 6.6 and 6.11) presents the number of communicative acts the child has attempted distributed by the categories given above.

- The second type (tables 6.2, 6.7 and 6.12) groups these acts into communicative modes. It is important to note here that not all acts are included: items under categories c6, c11, c12 and c14 in table 6.1 were not counted, since they were considered not relevant for the analysis of the child's modes of communication.

- The third type of table (tables 6.3, 6.8 and 6.13) combines the information of the two previous types, giving the child's communicative acts distributed by communicative modes (categories c6 - off topic comments, c11- simultaneous reading, c12 - performing actions and c14 - others were considered not relevant for this analysis).

- A fourth type (tables 6.4, 6.9 and 6.14) is dedicated to the distribution by categories of the teacher's communicative acts.

- The fifth type of tables (6.5, 6.10, 6.15) lists the turn-taking participation of both child and teacher during the interactions.

6.3.2.1. Nuno/Teacher Dyad

Table 6.1: Number of Nuno's communicative acts during interactions with his Teacher, in January and July 95.

	Categories of child's communicative acts	Total	
		Jan	Jul
c1	- Labels or comments	5	23
c2	- Answering yes/no questions	26	49
c3	- Asking questions	1	7
c4	- Relating the story to experience	0	6
c5	- Predictions	0	18
c6	- Off topic comments	15	5
c7	- Asking to turn the page	15	25
c8	- Asking to point to the pictures or to the text	0	13
c9	- Asking to read the text by himself	0	5
c10	- Filling in a symbol, word or line	0	10
c11	- Reading the book/sentence with the adult	0	10
c12	- Performing actions	12	22
c13	- Unintelligible acts	16	9
c14	- Others	6	13
	Total	96	215
	Duration of session (minutes)	11	31,5

Table 6.2: Number of Nuno's communicative modes during interactions with his Teacher.

Modes	Jan	Jul
Eye+Facial+Body	48	45
Vocalisations	15	48
AAC	0	72
Total	63	165
Duration of session (min)	11	31.5

Table 6.3: Distribution of modes used by Nuno by categories of communicative acts.

		Used modes					
	Communicative acts	Eye/Fa		Vocali		AAC	
		Jan	Jul	Jan	Jul	Jan	Jul
c1	- Labels or comments	3	2	2	13	-	8
c2	- Answering yes/no questions	24	31	2	15	-	3
c3	- Asking questions	0	5	1	2	-	0
c4	- Relating the story to experience	0	2	0	1	-	3
c5	- Predictions	0	1	0	2	-	15
c6	- Off topic comments	-	-	-	-	-	-
c7	- Asking to turn the page	13	1	2	4	-	20
c8	- Asking to point to the pictures or to the text	0	2	0	1	-	10
c9	- Asking to read the text by himself	0	1	0	0	-	4
c10	- Filling in a symbol, word or line	0	0	0	1	-	9
c11	- Reading the book/sentence with the adult	-	-	-	-	-	-
c12	- Performing actions	-	-	-	-	-	-
c13	- Unintelligible acts	8	0	8	9	-	0
c14	- Others	-	-	-	-	-	-
	Total	48	45	15	48	-	72

Table 6.4: Number of Teacher's communicative acts during interactions with Nuno, in January and July 95.

	Categories of adult's communicative acts	Total	
		Jan	Jul
a1	- Labels or comments	33	17
a2	- Yes/No questions	19	10
a3	- Open-ended questions	16	3
a4	- Relating the story to experience	4	8
a5	- Predictions	9	14
a6	- Directives	13	26

a7	- Off topic comments	0	2
a8	- Confirmations/clarifications	16	102
a9	-Reading the text	20	12
a10	- Encouraging the child to read	0	14
a11	- Simultaneous reading	0	10
a12	- Providing Support	0	26
a13	- Pointing to symbols or words while talking	0	10
a14	- Repetition	5	24
a15	- Others	0	2
	Total	135	280
	Duration of session (minutes)	11	31,5

Table 6.5: Number of Turns for Nuno and his Teacher during interaction.

Turn taking	Jan		July	
	# turns	percent	# turns	percent
Child: Nuno	86	44 %	185	44,3 %
Adult: Teacher	110	56 %	233	55,7 %
Total of turns	196	100 %	418	100 %
Duration of session	11 min.		31.5 min.	

6.3.2.2. João/ Teacher Dyad

Table 6.6: Number of João's communicative acts during interactions with his Teacher, in January and July 95.

	Categories of child's communicative acts	Total	
		Jan	Jul
c1	- Labels or comments	5	5
c2	- Answering yes/no questions	19	49
c3	- Asking questions	0	0
c4	- Relating the story to experience	0	1
c5	- Predictions	0	12
c6	- Off topic comments	0	0
c7	- Asking to turn the page	4	20
c8	- Asking to point to the pictures or to the text	0	5
c9	- Asking to read the text by himself	0	1
c10	- Filling in a symbol, word or line	0	11
c11	- Reading the book or sentence with the adult	0	19
c12	- Performing actions	11	20
c13	- Unintelligible acts	0	1
c14	- Others	1	8
	Total	40	152
	Duration of session (minutes)	10	34

Table 6.7: Number of João's Communicative Modes during interactions with his Teacher.

Modes	Jan	Jul
Eye/Facial/Body	27	62
Vocalisations	2	2
AAC	-	41
Total	29	105
Duration of session (min)	10	34

Table 6.8: Distribution of Modes used by João by categories of communicative acts.

		Used modes					
	Functions	Eye/Fa		Vocali		AAC	
		Jan	Jul	Jan	Jul	Jan	Jul
c1	- Labels or comments	5	4	0	0	-	1
c2	- Answering yes/no questions	17	47	2	2	-	0
c3	- Asking questions	0	0	0	0	-	0
c4	- Relating story to experience	0	0	0	0	-	1
c5	- Predictions	0	1	0	0	-	11
c6	- Off topic comments	0	0	0	0	-	0
c7	- Asking to turn the page	4	6	0	0	-	14
c8	- Asking to point to the pictures or to the text	0	2	0	0	-	3
c9	- Asking to read the text by himself	0	0	0	0	-	1
c10	- Filling in a symbol, word or line	0	1	0	0	-	10
c11	- Reading the book or sentence with the adult	-	-	-	-	-	-
c12	- Performing actions	-	-	-	-	-	-
c13	- Unintelligible Acts	0	1	0	0	-	0
c14	- Others	-	-	-	-	-	-
	Total	27	62	2	2	-	41

Table 6.9: Number of Teacher's communicative acts during interactions with João, in January and July 95.

	Categories of adult's communicative acts	Total	
		Jan	Jul
a1	- Labels or comments	21	11
a2	- Yes/No questions	11	19
a3	- Open-ended questions	8	4
a4	- Relating story to experience	0	8
a5	- Predictions	6	10
a6	- Directives	10	26
a7	- Off topic comments	0	0

a8	- Confirmations/clarifications	15	77
a9	- Reading the text	11	5
a10	- Encouraging the child to read	0	16
a11	- Simultaneous reading	0	20
a12	- Providing support	5	44
a13	- Pointing to symbols or words while talking	0	31
a14	- Repetition	4	5
a15	- Others	0	2
	Total	91	278
	Duration of session (minutes)	10	34

Table 6.10: Number of Turns for João and his Teacher during interaction.

Turn taking	Jan		July	
	# turns	percent	# turns	percent
Child: João	33	30%	117	46%
Adult: Teacher	79	70%	134	53%
Total of turns	112	100%	251	100%
Duration of session	10 min.		34 min.	

6.3.2.3. André/Teacher Dyad

Table 6.11: Number of André's communicative acts during interactions with his Teacher, in January and July 95.

	Categories of child's communicative acts	Total	
		Jan	Jul
c1	- Labels or comments	11	18
c2	- Answering to yes/no questions	9	26
c3	- Asking questions	1	2
c4	- Relating the story to experience	0	0
c5	- Predictions	0	3
c6	- Off topic comments	0	1
c7	- Asking to turn the page	7	20
c8	- Asking to point to the pictures or to the text	0	0
c9	- Asking to read the text by himself	0	0
c10	- Filling in a symbol/word or line	0	10
c11	- Reading the book or sentence with the adult	0	13
c12	- Performing actions	7	13
c13	- Unintelligible acts	1	15
c14	- Others	0	25
	Total	36	146
	Duration of the session (minutes)	8,5	30,3

Table 6.12. Number of André's Communicative Modes during interactions with his Teacher.

Modes	Jan	Jul
Eye/Facial/Body	24	36
Vocalisations	5	11
AAC device	0	48
Total	29	95
Duration of session (min)	8.5	30.3

Table 6.13: Distribution of Modes used by André by categories of communicative acts.

		Used modes					
	Functions	Eye/Fa		Voc		AAC	
		Jan	Jul	Jan	Jul	Jan	Jul
c1	- Labels or comments	9	12	2	2	-	3
c2	- Answering yes/no questions	8	14	1	2	-	10
c3	- Asking questions	0	2	0	0	-	0
c4	- Relating story to experience	1	0	0	0	-	0
c5	- Predictions	0	1	0	0	-	6
c6	- Off topic comments	-	-	-	-	-	-
c7	- Asking to turn the page	5	0	2	1	-	19
c8	- Asking to point to the pictures or to the text	0	0	0	0	-	0
c9	- Asking to read the text by himself	0	0	0	0	-	0
c10	- Filling in a symbol, word or line	0	0	0	0	-	10
c11	- Reading the book or sentence with the adult	-	-	-	-	-	-
c12	- Performing actions	-	-	-	-	-	-
c13	- Unintelligible acts	1	7	0	6	-	0
c14	- Others	-	-	-	-	-	-
	Total	24	36	5	11	0	48

Table 6.14: Number of Teacher's communicative acts during interactions with André, in January and July 95.

	Categories of adult's communicative acts	Total	
		Jan	Jul
a1	- Labels or comments	20	15
a2	- Yes/No questions	6	10
a3	- Open-ended questions	2	5
a4	- Relating the story to experience	0	11
a5	- Predictions	7	12
a6	- Directives	8	15

a7	- Off topic comments	0	0
a8	- Confirmations/clarifications	15	54
a9	- Reading of the text	10	11
a10	- Encouraging the child to read	0	12
a11	- Simultaneous reading	0	13
a12	- Providing support	1	39
a13	- Pointing to symbols or words while talking	0	37
a14	- Repetition	3	13
a15	- Others	1	3
	Total	73	250
	Duration of session (minutes)	8,5	30,3

Table 6.15: Number of Turns for André and his Teacher during interaction.

Turn taking	Jan		July	
	# turns	percent	# turns	percent
Child: André	29	38 %	110	40 %
Adult: Teacher	48	62 %	166	60 %
Total of turns	196	100 %	418	100%
Duration of session	8,5 min.		30,3 min.	

6.3.3. Data on Child/Mother Interactions

When previously describing the design of this study in chapter 3.1. it was mentioned the intention of introducing a second component to the study, to observe the introduction of similar story based activities in the home setting with a family member. It was considered that although variables would exist between subjects, this additional data might provide insights into the children's awerness of the stories in other contexts and on the extent to which each child appeared to increase their emergent literacy behaviours. These data were gathered through interview with the family member and through video. The data drawn from analysis of the video was gathered using the same pre-established measures, used at the teacher/child interactions described at the previous section.

For this purpose, the families (two mothers and one sister) were asked to participate in the study, by submitting to videotaping one story reading interaction with their children, both before and after the study. The dyads at home were asked to interact as they normally would when reading a story. Interactions were representative of the children's and the mother/sister's usual behaviour and communication, during typical story reading sessions.

At the first session, the child was free to choose any story book (as he was at the pre-intervention session with the teacher). For the post-intervention interaction with mothers, the story book "How do I put it on?", read with the teacher, was sent home, so that both interactions (child/teacher and child/mother) were based on the same story book.

The six videotape recordings were transcribed and coded following the same procedures as used in the analysis of the child/teacher interactions. The data so collected for each child's interaction with his mother/sister are presented in four different types of tables. The first type (tables 6.16, 6.20 and 6.24) presents the

number of communicative acts the child attempted distributed by the categories given above in 6.3.1. The second type (tables 6.17, 6.21 and 6.25) groups these acts into communicative modes. A third type of table (tables 6.18, 6.22 and 6.26) is dedicated to the distribution by categories of the mother/sister's communicative acts. Finally, the fourth type of tables (6,19, 6.23, 6.27) quantifies the turn taking participation of both child and mother/sister during the interactions.

6.3.3.1. Nuno/Sister Dyad

Table 6.16: Number of Nuno's communicative acts during interactions with his Sister, in January and July 95.

	Categories of child's communicative acts	Total	
		Jan	Jul
c1	- Labels or comments	0	0
c2	- Answering yes/no questions	0	2
c3	- Asking questions	0	0
c4	- Relating experience	0	0
c5	- Predicting	0	0
c6	- Off topic comments	2	0
c7	- Asking to turn the page	0	0
c8	- Asking to point to the pictures or to the text	3	0
c9	- Asking to read the text by himself	0	0
c10	- Filling in a symbol/word or line	0	0
c11	- Reading the book/sentence with the adult	0	0
c12	- Performing actions	0	0
c13	- Unintelligible acts	9	15
c14	- Others	2	6
	Total	16	23
	Duration of session (minutes)	2	2.5

Table 6.17: Number of Nuno's communicative modes during the interactions with his Sister.

Modes	Jan	Jul
Eye+Facial+Body	8	6
Vocalisations	6	17
AAC	-	-
Total	14	23
Duration of session (min)	2	2.5

Table 6.18: Number of Sister's communicative acts during interactions with Nuno, in January and July 95.

	Categories of adult's communicative acts	Total Jan	Total Jul
a1	- Labels or comments	1	0
a2	- Yes/No questions	0	1
a3	- Open-ended questions	0	0
a4	- Relating the story to experience	0	0
a5	- Predictions	0	0
a6	- Directives	0	0
a7	- Off topic comments	2	5
a8	- Confirmations/Clarifications	3	1
a9	- Reading the text	11	15
a10	- Encouraging the child to read	0	0
a11	- Simultaneous reading	0	0
a12	- Providing Support	0	0
a13	- Pointing to symbols or words while talking	0	0
a14	- Repetition	0	2
a15	- Others	0	0
	Total	17	24
	Duration of session (minutes)	2	2.5

Table 6.19: Number of Turns for Nuno and his Sister during interaction.

Turn taking	Jan		July	
	# turns	percent	# turns	percent
Child: Nuno	15	46 %	23	49 %
Adult: Sister	17	53 %	24	51 %
Total of turns	32	100%	47	100%
Duration of session	2 min.		2.5 min.	

6.3.3.2. João/Mother Dyad

Table 6.20: Number of João's communicative acts during interactions with his Mother, in January and July 95.

	Categories of child's communicative acts	Total	
		Jan	Jul
c1	- Labels or comments	10	4
c2	- Answering yes/no questions	31	18
c3	- Asking questions	0	0
c4	- Relating the story to experience	0	0
c5	- Predictions	0	0
c6	- Off topic comments	0	0
c7	- Asking to turn the page	0	4
c8	- Asking to point to the pictures or to the text	0	0
c9	- Asking to read the text by himself	0	0
c10	- Filling in a symbol, word or line	0	0
c11	- Reading the book or sentence with the adult	3	1
c12	- Performing actions	35	13
c13	- Unintelligible acts	14	10
c14	- Others	1	0
	Total	94	50
	Duration of session (minutes)	20.33	9.5

Table 6.21: Number of João's communicative modes during interactions with his Mother.

Modes	Jan	Jul
Eye+Facial+Body	28	24
Vocalisations	28	12
AAC	-	-
Total	56	36
Duration of session (min)	20.3	9.5

Table 6.22: Number of Mother's communicative acts during interactions with João, in January and July 95.

	Categories of Adult's communicative acts	Total Jan	Total Jul
a1	- Labels or comments	40	10
a2	- Yes/No questions	21	12
a3	- Open-ended questions	7	2
a4	- Relating the story to experience	3	0
a5	- Predictions	0	3
a6	- Directives	36	12
a7	- Off topic comments	1	0
a8	- Confirmations/clarifications	46	26
a9	- Reading the text	17	16
a10	- Encouraging the child to read	0	9
a11	- Simultaneous reading	3	1
a12	- Providing support	2	3
a13	- Pointing to symbols or words while talking or reading	0	0
a14	- Repetition	11	6
a15	- Others	5	0
	Total	192	100
	Duration of session (minutes)	20.33	9.5

Table 6.23: Number of Turns for João and his Mother during interaction.

Turn taking	Jan		July	
	# turns	percent	# turns	percent
Child: João	55	29 %	23	32 %
Adult: Mother	137	71 %	76	67 %
Total of turns	192	100%	99	100%
Duration of session	20,33 min.		9,5 min.	

6.3.3.3. André/Mother Dyad

Table 6.24: Number of André's communicative acts during interactions with his Mother, in January and July 95.

	Categories of Child's communicative acts	Total Jan	Jul
c1	- Labels or comments	1	1
c2	- Answering yes/no questions	2	7
c3	- Asking questions	0	0
c4	- Relating the story to experience	0	1
c5	- Predictions	0	0
c6	- Off topic comments	4	3
c7	- Asking to turn the page	0	5
c8	- Asking to point to the pictures or to the text	0	0
c9	- Asking to read the text by himself	0	0
c10	- Filling in a symbol, word or line	0	0
c11	- Reading the book or sentence with the adult	1	18
c12	- Performing actions	13	14
c13	- Unintelligible acts	3	7
c14	- Others	2	1
	Total	26	57
	Duration of session (minutes)	4	6,5

Table 6.25: Number of André's communicative modes during interactions with his Mother.

Modes	Jan	Jul
Eye+Facial+Body	6	14
Vocalisations	2	9
AAC	-	-
Total	8	22
Duration of session (min.)	4	6.5

Table 6.26: Number of Mother's communicative acts during interactions with André, in January and July 95.

	Categories of Adult's communicative acts	Total Jan	Jul
a1	- Labels or comments	18	12
a2	- Yes/No questions	1	9
a3	- Open-ended questions	2	3
a4	- Relating the story to experience	0	3
a5	- Predictions	0	3
a6	- Directives	10	11
a7	- Off topic comments	0	0
a8	- Confirmations/clarifications	1	6
a9	- Reading the text	21	3
a10	- Encouraging the child to read	0	1
a11	- Simultaneous reading	1	18
a12	- Providing support	0	0
a13	- Pointing to symbols or words while talking	0	0
a14	- Repetition	0	0
a15	- Others	1	1
	Total	55	70
	Duration of session (minutes)	4	6,5

Table 6.27: Number of Turns for André and his Mother during interaction.

Turn taking	Jan		July	
	# turns	percent	# turns	percent
Child: André	12	21 %	25	34 %
Adult: Mother	46	79 %	49	66 %
Total of turns	58	100 %	74	100%
Duration of session	4 min.		6,5 min.	

6.3.4. Interrater Reliability Checks

The reliability of these latter data is primarily dependent on the ability of the researcher to distinguish and correctly classify the numerous communication attempts occurring during each of those sessions. This is by no means a trivial task, and following similar procedures described in the literature (see, for instance, Light et. al., 1994), interrater reliability checks were undertaken on the classification procedures using two persons other than the researcher. Both these people were experienced professionals in the field of disability, familiar with the children's communicative behaviour and the teacher's pedagogical methods. Standardisation was addressed using the following training process in the coding procedures:

Inter-observer agreement was measured by calculating reliability coefficients according to Tawney & Gast (1984), the number of agreements divided by the number of agreements plus disagreements. The reliability coefficients for coder one were 0.950 for the children and 0.976 for the adults; for the second coder, 0.937 and 0.984 for children and adults, respectively. The results of the different videotaped sessions are given in the following table 6.28.

Table 6.28: Comparison between the number of interactions coded by the researcher and the two other observers for all videotaped story reading interactions of this study.

	Dyads	Researcher (number of interactions)		2nd Coder (number of disagreements)		3rd Coder (number of disagreements)	
		Adult	Child	Adult	Child	Adult	Child
1	Nuno/Sister Jan	12	9	0	0	0	0
2	Nuno/Sister Jul	24	23	0	0	0	0
3	João/Mother Jan	19	9	1	0	0	1
4	João/Mother Jul	12	5	1	0	0	0
5	André/Mother Jan	30	15	0	0	0	0
6	André/Mother Jul	31	24	0	4	0	1
7	Nuno/Teacher Jan	24	19	0	2	1	0
8	Nuno/Teacher Jul	23	20	0	0	1	3
9	João/Teacher Jan	26	9	0	1	0	2
10	João/Teacher Jul	16	9	3	1	1	1
11	André/Teacher Jan	17	6	1	0	0	2
12	André/Teacher Jul	17	12	0	0	1	0
	Total	251	160	6	8	4	10
	Reliability			97,6%	95%	98,4%	93,7%

Light, Binger and Kelford Smith (1994), in their study of story reading interactions of AAC preschoolers and their mothers, obtained comparable reliability coefficients of 96% for the children's behaviour and 90% for the mother. Heim (1990) has also measured interjudge agreement in the coding process of videotaped conversation sessions of three children with SSPI and adults. She obtained slightly lower values for reliability coefficients, of the order of 85 %. The reliability figures presented in table 6.28 compare favourably with those of Light, Binger and Kelford Smith (1994) and Heim (1990), and give confidence in the data described.

Chapter 7: Discussion of Results

7.1. Introduction

"Is there really a typical clinician? A typical AAC user? A typical environment? A typical AAC intervention? Probably NOT. We are constantly dealing with "moving targets". How do we hit a moving target? One possible strategy is to pay attention to the trajectory, and aim for where the target will be, rather than where it is coming from."

Blackstone, 1995

This Chapter addresses the outcomes of this intervention study in relation to the initial research questions. Findings will be discussed in relation to existing research, analysing the participation patterns of both children and adults, the different modes used by the children and the content of the communicative acts produced by the children and by the adults during the interactions, that were identified as important predictors of the development of children's emergent literacy behaviours.

The question of efficacy and effectiveness in relation to the evaluation of AAC studies, has been lately a focus of some AAC research studies (Schlosser,. & Braun, 1994).

Efficacy is defined by Schlosser, R. W. & Braun, U. (1994), as an umbrella term, comprising not only effectiveness, but also efficiency and effects. As stated by these authors, effectiveness refers to the demonstration of behaviour change as a direct result of treatment, while efficiency refers to the demonstration of comparative effectiveness of at least two treatments in terms of several criteria (e.g. cost, time). Effects refer to the determination of treatment components that are relevant and the demonstration of links of treatment components to specific changes.

It is therefore important to make a distinction between studies of efficacy and effectiveness with respect to outcomes. Granlund (1996), defines outcomes as changes in behaviour, attitudes, beliefs, environment or economy during a specified

changes in behaviour, attitudes, beliefs, environment or economy during a specified time period. Outcomes can be related either to real life events or effects of intervention. As he further argues, in discussing outcome research we are especially interested in effects of intervention, and to the extent intervention outcomes match needs and events in every day life.

According to Blackstone (1995), we have to look at effectiveness in real life situations, rather than efficacy under ideal conditions. As she argues the challenge is to develop and disseminate interventions most likely to be effective even in situations less than ideal from the perspective of researchers. She further argues that outcomes measurement should be consumer-driven, flexible and enduring.

The researcher in this study was engaged in a constant process of evaluating the teaching methods and the children's progress and consequently readapting activities in order to achieve the optimum level of difficulty. This approach termed "formative evaluation" enabled the researcher to use scaffolding during the study, planning, teaching, and intervening.

Vygotsky (1978) sees the role of the "expert" adult (such as teachers) as that of helping children gain competence. The experts adjust the amount of assistance required for each child to succeed on a particular task. By instructing and modelling, adults assume responsibility for parts of the task in order to let the child concentrate on other components. As the child's competence increases, adult support is reduced, allowing the child to assume an increasingly independent role. This process appears to be a naturally occurring instructional method used by mothers with their children, and is adequately termed "scaffolding" because it helps the child to learn how to do things that they could not do alone. It can be seen how this approach to teaching is likely to promote the child's confidence in his ability to solve problems, and empower him to control his environment. The result of AAC interventions, as Blackstone (1995) states, should be an improved quality of life for persons who use AAC.

The previous three chapters presented the data obtained in the course of this study. These data were of essentially two natures: either qualitative descriptions by researcher, mothers and staff of the Cerebral Palsy Centre or quantitative results of coded communication acts in videotaped storybook reading sessions.

The qualitative observational and other data provided the foundation for the intervention design and implementation. The pre- and post- intervention storybook readings, which were videotaped, provided the principal data from which comparison could be made over the study, from which indicative of gains could be drawn. These data were analysed quantitatively, as a means of verifying the qualitative data. It is these results that are primarily described in this chapter.

7.2. Analysis of Quantitative Data

The analysis of quantitative data is based on the coding analysis of twelve videotape story book reading sessions . The duration of these sessions, identified in the tables presented in the previous chapter, varied significantly. Differences are due to a multitude of factors, the main one being that the family members or the teacher were supposed to act as they would normally do during a storybook reading interaction. It would not be realistic to expect them to interact and videotape exactly during the same time. As a result, the sessions vary from 8,5 to 34 minutes for the child/teacher interactions, and from 2 to 20 minutes for the child/mother interactions.

In order to allow comparisons of the different sessions, rates in number of acts per minute were used. A problem of the meaning and reliability of these rates might be posed, however, when comparing different sessions, due to the above mentioned large differences in duration. In relation to this, it should be noted, that the numbers corresponding to the January or to the July sessions, taken separately, are much more homogeneous. The ranges are: for the child/teacher interactions from 8,5 to 11 minutes

in January, and 30,3 to 34 minutes in July; for the child/mother interactions, from 2 to 20,3 minutes in January and 2,5 to 9,5 minutes in July.

The final sessions (July) with the teacher lasted much longer than either the January ones, or the sessions at home with the mother. This is essentially a consequence of two factors. First, all three children increased their attention span during the intervention period, as mentioned in subchapter 6.2, and it was therefore possible to keep them interested for longer times in story book reading at the end of the study. Second, children were strongly motivated to use their AAC systems at school (which at home they did not), a technique that, although more efficient, can be more time consuming than a natural mode of communication. Also their knowledge about what they were supposed and able to do or perform during the storybook reading interaction, strongly influenced their longer engagement.

Because differences in the duration of the sessions were considered of major concern in this study, a measure of whether the rate calculation procedures were introducing a significant bias in the comparisons was sought. The longer sessions (30 minutes) were those involving João and André and the teacher. These sessions were divided in three parts of equal duration (approximately 10 minutes each). The transcripts for those parts were then analysed separately. The total number of acts distributed among the first, middle and last thirds in the following way: for João: 46-40-47; for André: 40-54-52; for the teacher with João: 102-71-75; for the teacher with André: 83-79-88. Discrimination by communicative modes for each of the children showed similar patterns of consistency. The AAC aided modes, for instance, were distributed for João as 12-11-11 and for André as 16-16-16. It was concluded that the use of overall rates (per minute) was not a significant cause of error in this study.

As a final comment, it must be mentioned that the storybook reading sessions of Nuno with his sister are much shorter than all the others, due to the specifically home situation already mentioned. The quantitative data taken from these sessions should be

viewed as much less reliable than for all the other interactions.

7.2.1. Communicative Form, Use and Content

The numbers of communicative acts during each storybook reading session performed by the three children in this study were presented in the previous chapter (section 6.3) as to form, use and content. Various tables listed these numbers grouped in different ways, in order to allow a separate analysis of the above mentioned factors.

As to the adults, mothers or teacher, in interaction with those children, their communication behaviour was also classified, so that it could be analysed as to use and content. Form was not considered to be a relevant factor in this case, according to the study of Heim (1990), where she concluded that the use of nonvocal modes by the adult did not have a clear differential impact on the means of message transmission chosen by the children. In the following sub-chapters, the results presented in section 6.3 will be examined and interpreted.

7.2.1.1. Communicative Form

Communicative form refers to the means of communication used by non verbal children. In this study, modes of communication were divided into three groups. Two of the groups involved unaided communication. Eye-gazing, facial and body expressions constituted one unit, since they were most often used together. The second group contained vocalisations. Finally, as a third group, AAC aided communication included any use of graphic symbols for communication either with or without voice output.

The interpretation of the data requires a good understanding of the most important starting differences between the three children that were the object of this study. As

pointed out in Chapter 4, at the beginning Nuno was already familiar with AAC aided communication. He was not however able to use symbols effectively yet due to physical restraints on reaching and manipulating the aids. The other two children, João and André, had their first exposure to AAC within the context of the study and at the beginning were not able yet to use symbols in any functional way.

On the other hand, when student-family interactions were analysed, it was found that none of the mothers provided their children with access to an AAC aided system during the story reading, either in January or in July. This finding is consistent with studies of Light, Binger & Kelford Smith (1994), and Light & Kelford Smith (1993), in which none of the children that participated in both studies were provided by their family with access to their AAC aided systems during the storybook reading interactions.

In this particular study, mothers mentioned that it was very difficult to use a communication board at the same time as they were holding and reading the storybook. Therefore, only group 1 (eye gazing, facial/body expression) and group 2 (vocalisations) modes of communication were analysed in the home contexts.

a) Child/Teacher Storybook Reading Interaction: Communicative Form

Results for the Nuno/teacher interaction were presented in Table 6.2. They are graphically visualised (in percentage of total for each session) in Figure 7.1. below, and indicate that Nuno's primary mode of communication was, in January "Eye+Facial+Body" (72,4%), compared to a much shorter use of "Vocalisations" (27,5%).

The use of AAC aided communication was introduced after the initial phase of this intervention study (that is why it is not analysed in January). The use of AAC in the final phase was a very important new factor, since it became his primary mode of communication in July (43,6%). As to "Vocalisations" its use was similar in both

could lead to the conclusion that some of these modes were replaced by the use of AAC aided modes (43,6%), a fact that will be further discussed when analysing the communicative content of the interactions.

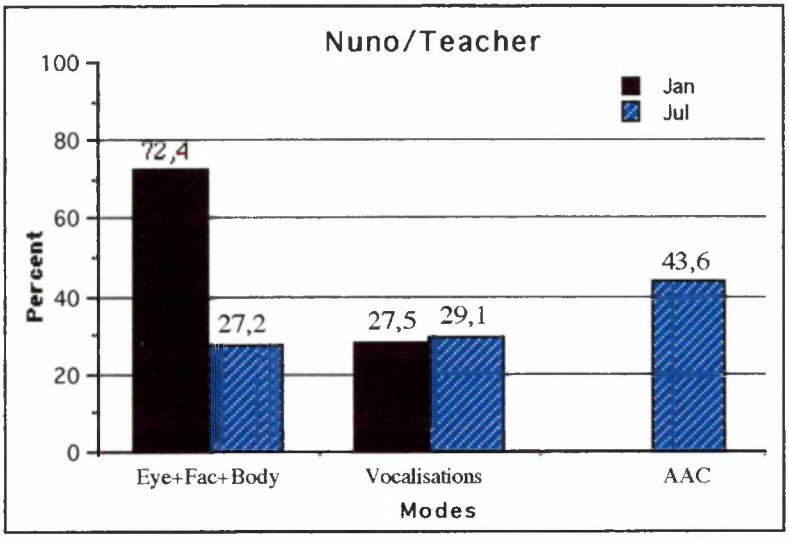


Figure 7.1: Modes of communication used by Nuno during interactions with his teacher, in January and July.

As to the João/teacher interaction, Table 6.7. indicates that eye-gaze and facial/body expression was his primary mode of communication both in January (93,1%) and in July (59,2%) as represented in the next graphic (Figure 7.2.).

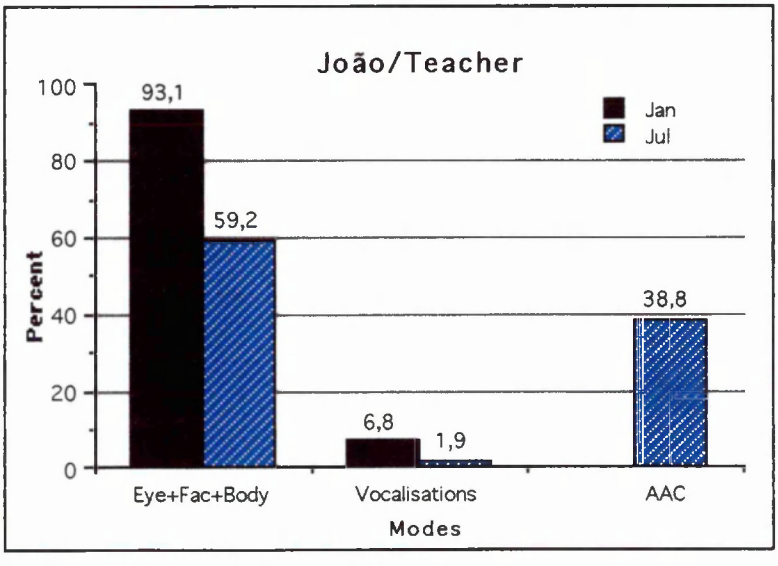


Figure 7.2: Modes of communication used by João during interactions with his teacher, in January and July.

Vocalisations were rare (6,8%) in January, and even scarcer in July (1,9%). This

could be related to the fact that his breathing difficulties, due to physical constraints, interfered with his ability to vocalise and forced him to rely on other modes of communication.

It was very difficult to decode João's communicative behaviours, since his body and facial expressions were so poor. Furthermore, his head control was also very poor, which made it difficult to identify his eye gaze or facial communication. AAC aided modes improved his communication and he made use of it 38,8% of interactions in July. This is remarkably high, since it was the first time João was benefiting from an AAC based intervention.

Regarding André, Table 6.12 shows his use of communicative modes. In January he obviously relied more on the use of eye gaze, facial and body expressions for communication (82,7 %), comparing with a lower use of vocalisations (17,2%). By July a noticeable change in modes had occurred. His primary mode of communication had become AAC aided modes (50,4%). Taking into consideration the fact that this child had recently been introduced to some of these AAC techniques, this can be considered as an important qualitative outcome in André's progress.

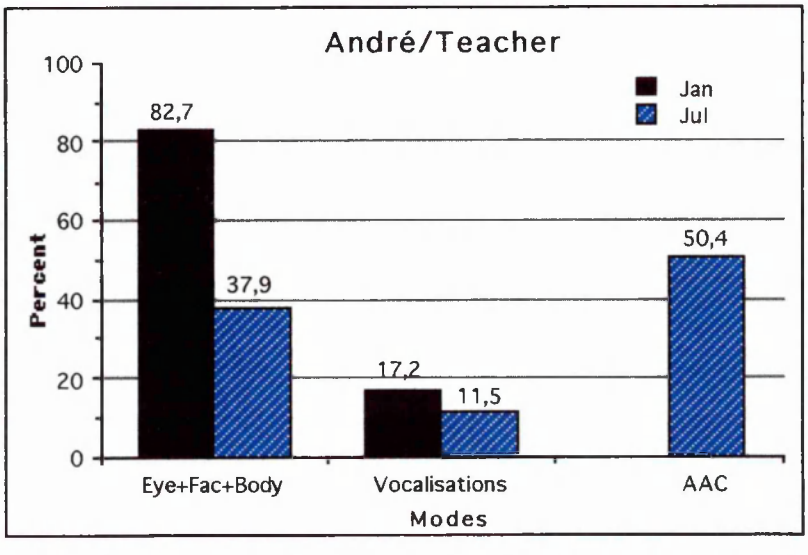


Figure 7.3: Modes of communication used by André during interactions with his teacher, in January and July.

As a conclusion, it may be pointed out that in January, at the beginning of the study, the use of eye-gaze, facial or body expressions predominated in all three cases over vocalisations. In contrast the same children, after a period of six months of an AAC based intervention, clearly relied on AAC systems to communicate in two of the cases (Nuno and André). João, while maintaining the use of eye-gaze, facial or body expressions as his primary mode of communication, was already showing a remarkably high use of AAC.

b) Child/Mother Storybook Reading Interaction: Communicative Form

Nuno's storybook reading interactions, both in January and July, were with his sister, as already explained in previous chapters. The results appear in Table 6.17. Figure 7.4 illustrates that Nuno was using eye gazing, facial and body expressions as his primary mode of communication in January (62,5%), with much less use of vocalisations (37,5%). In contrast, his vocalisations significantly increased in July (73,9%), not only in frequency, but also qualitatively, as they were much stronger and intentional.

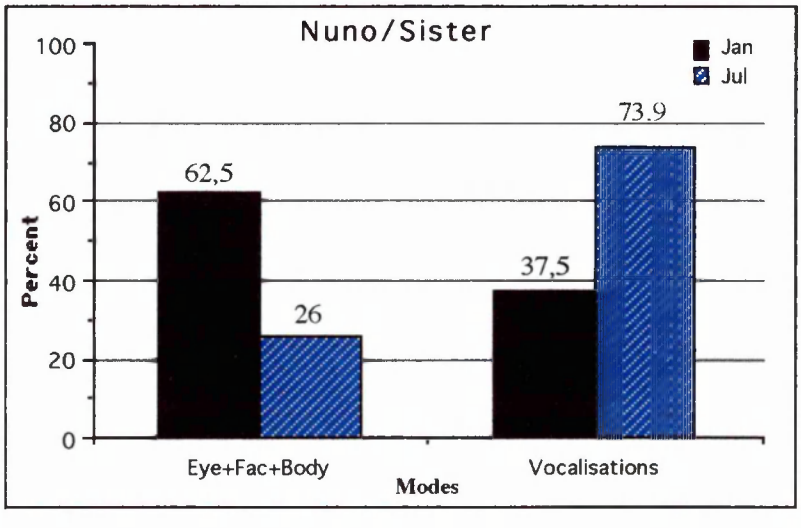


Figure 7.4: Modes of communication used by Nuno during interactions with his Sister in January and July.

In the case of João's interaction with his mother, data presented in Table 6.21. indicate that in January he used the combination of eye gaze, facial and body expression on an

equal basis (50% each) with vocalisations, as is graphically presented in Figure 7.5. below. This contrasted with the July data, which showed a greater reliance on eye-gaze, facial and body expressions (66,8%), with a decreased use of vocalisations (33,2%). This decrease in vocalisations was also identified in the July interaction with his teacher.

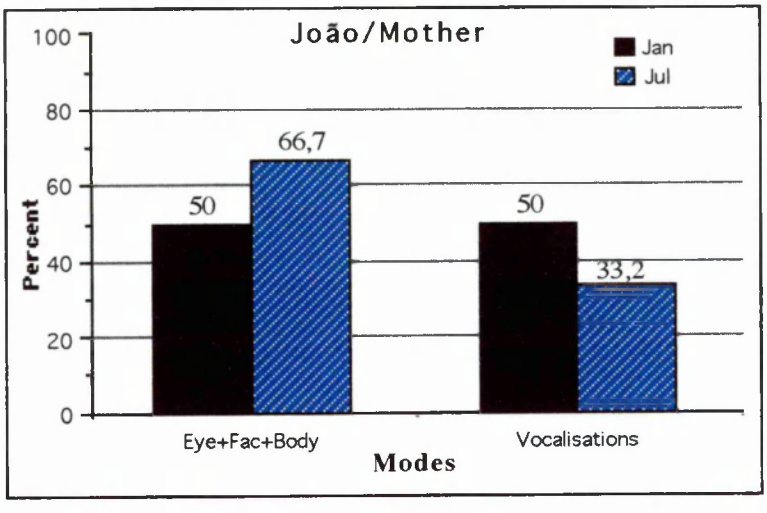


Figure 7.5: Modes of communication used by João during interactions with his Mother, in January and July.

In Table 6.25 and in Figure 7.6, data for André's modes of communication during the interaction with his mother are presented.

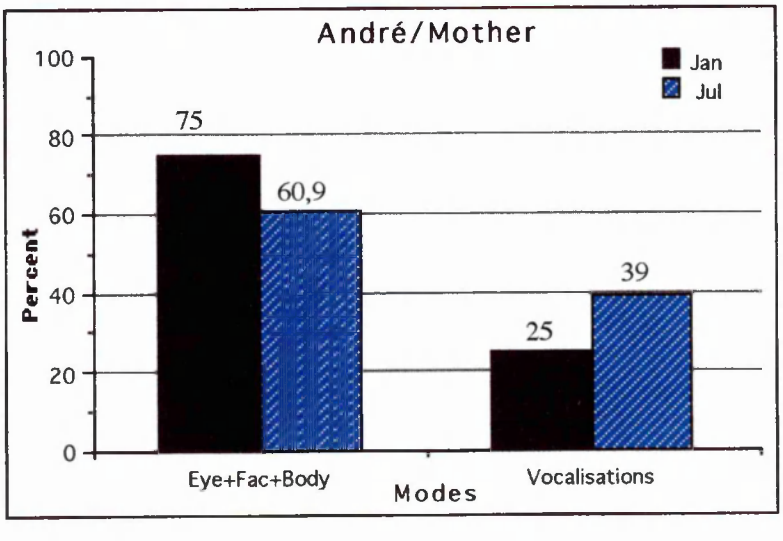


Figure 7.6: Modes of communication used by André during interactions with his Mother, in January and July.

His primary mode of communication is, in both situations, eye gazing, facial or body language (75%; 60,9%) as can be observed in the graphic above, referring to the two situations, January and July. This fact is not surprising since, when André wants to communicate, due to his very high muscular tone, he does it with all his body (eye+facial+body) with or without vocalisations. Nevertheless his vocalisations did increase from 25% in January, to 39% in July.

In summary, it can be confirmed that two of the children (Nuno and André), who in January relied more on eye gazing, facial and body expressions to express their intent, changed their behaviour in July, using vocalisations as their primary mode of communication. The other child, João, who used both group modes on an equal basis in January, changed to a decrease on his vocalisations in July.

7.2.1.2. Analysis of Communicative Use

Communicative use is essentially related to participation patterns in conversational interaction, that is, turn-taking and rates of communicative acts. As previously described in sub-chapter 6.3, the definition of conversational turn is by no means uncontroversial. It is nevertheless a very useful concept, and it was decided, as pointed out in that sub-chapter, to follow Light et al. (1994), and adopt turn as meaning an intentional behaviour directed towards the partner, separated by pauses of one or more seconds. Thus, all intentional behaviour directed towards the partner was considered a turn, which may include one or multiple communicative acts produced in sequence without a pause between them.

In this subchapter the participation patterns during the story reading interactions are discussed.

a) Child/Teacher Storybook Interaction: Communicative Use

The interactions in all three situations were synchronous, that is all dyads share the same topic in the interaction that of course was defined by the content of the story. Off topic comments occurred infrequently for both the children and the teacher. Only in the case of Nuno was he off topic 13,6 times (in 10 minutes) during the January interaction, decreasing to 1,6 times in July.

Tables 6.1, 6.6 and 6.11 give the total number of communicative acts and the duration of the videotaped sessions with the teacher for Nuno, João and André, respectively. Tables 6.4, 6.9 and 6.14 present similar numbers for the teacher's acts. From these data, rates of communicative acts were calculated. They are graphically summarised in Figure 7.7 below .

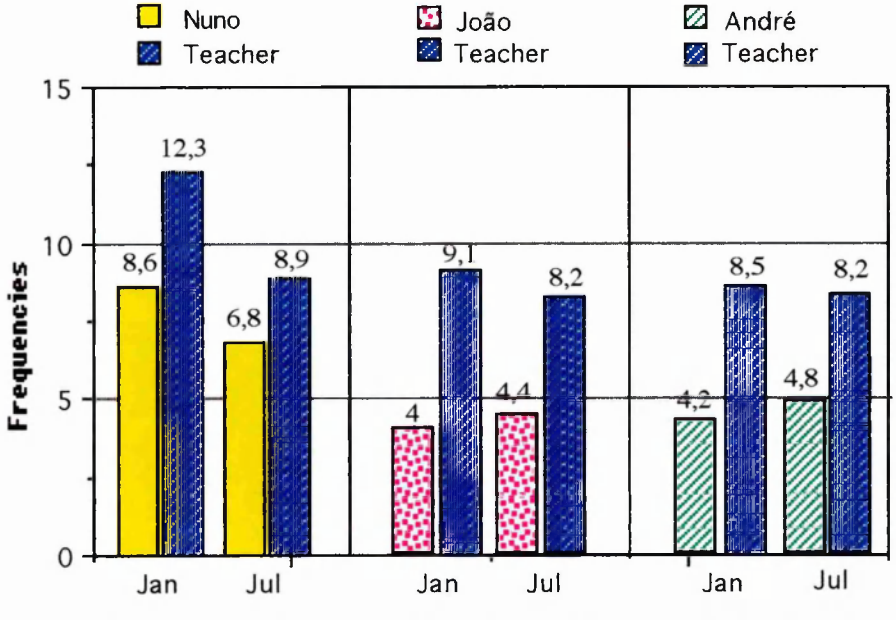


Figure 7.7: Rate of Communicative acts (per minute) for the Children and Teacher during the interactions in January and July

As it is immediately apparent, the interaction patterns are very similar for João and André, but these two differ significantly from Nuno.

João and André rated very similar results, from a low of 4 communicative acts per minute to a high of 4,8, and there was not much change in numbers from the start to

the end of the study. The same happened with the rate of communicative acts of the teacher, ranging from 9,1 to 8,2 per minute. On average the teacher produced approximately twice as many acts as her students during interactions.

The participation was clearly dominated by the adult, a finding consistent with earlier studies (Harris, 1982; Light, 1985; Light et al 1994).

Nuno was a different case. In January he rated twice as many acts as his colleagues (8,6 per minute), although decreasing in July to about 1.5 times (6,8 per minute). On the other hand, the teacher's participation was not as dominant as in the other two cases, rating less than 50% more acts either in January (12,3 per minute) or in July (8,9 per minute).

These two main differences in communicative use may be related to the fact that at the beginning of the study Nuno, had been in the classroom for two years, unlike his fellows, as explained who were comparative newcomers. He was therefore acquainted with the environment and more confident in his communicative abilities.

It should be noted, however, that a considerable percentage (32%) of his communicative acts in January were classified as "off topic" or "unintelligible", while in July these categories were reduced to 6,5%. If these were discarded, his rate would decrease to a level of about 6 per minute in both sessions. This is still 50% higher than the performance of his colleagues, but brings his pattern of communication closer to them in the similarity of the rates in January and July.

The second feature of communicative use is turn taking participation. Results presented in Table 6.5, 6.10, and 6.15 for Nuno, João and André, respectively. These results are graphically illustrated in figure 7.8 below.

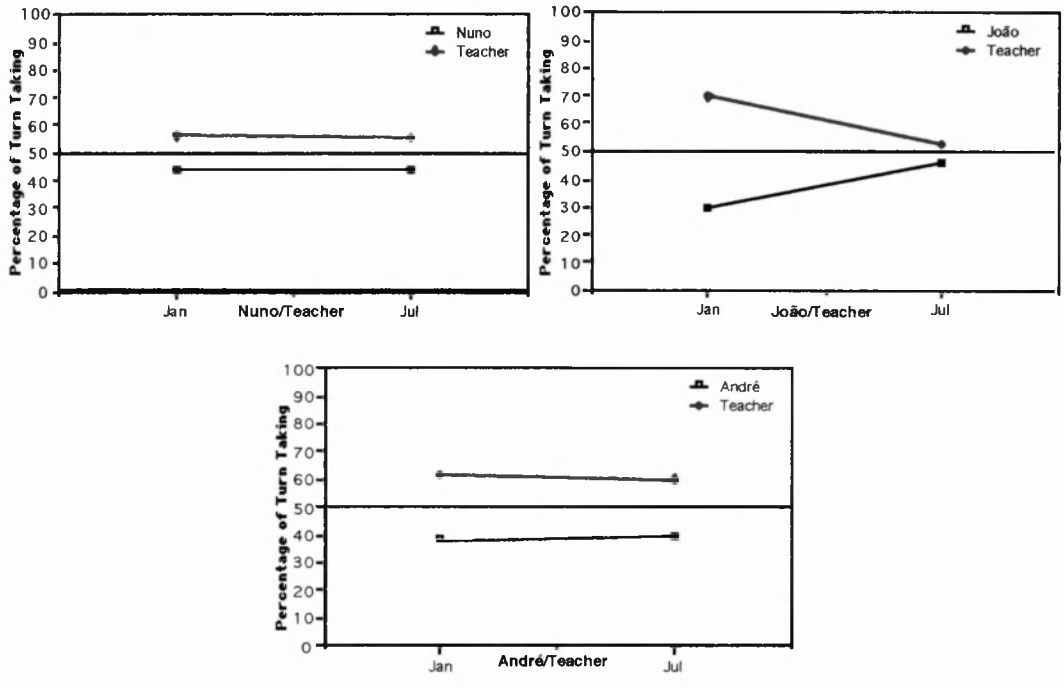


Figure 7.8: Percentage of Turn Taking Participation in the three Child/Teacher Dyads in January and July.

It can easily be seen that the turn taking participation is different for the three cases. As mentioned above, Nuno was already acquainted with the classroom environment in January, and therefore the notion of turn taking opportunity was familiar to him by then. The role of the teacher in the January session was therefore not markedly dominant, and the exchange was already very symmetrical at the beginning of the study (44%). The fact that Nuno practically did not improve his score in July (44,3%) may mean that he had already reached the maximum performance allowed by his capabilities.

In the other two cases, the children turn taking participation was most asymmetrical in January: João took 30% of the turns and André 38%, both considerably lower than Nuno.

In the case of João, there was a very striking progress resulting from the intervention program. He scored 46% of turn taking in July, reaching therefore a status of thorough competence in this aspect of communication. André, on the contrary,

showed very small evolution, obtaining a score of 40% in July. His exchanges remained therefore substantially asymmetrical.

It can be concluded that, as to communicative use in child/teacher storybook reading interactions, the adult significantly dominates the exchanges, rating from 1,5 to 2 times as many acts as the children. There was however a significant difference between the children that were not previously familiar with the type of interaction used in storybook reading (João and André) and the child that was already acquainted with it (Nuno), who performed at a higher level of conversational competence. The intervention program brought a very significant change in turn taking opportunity understanding for at least one of the children (João).

b) Child/Mother Story Book Reading Interaction: Communicative Use

When looking at these interactions, it can be concluded that in the case of João the interactions were synchronous, that means mother and child shared the same topic of interaction, defined by the story content. None of them produced off topic comments either in January or July. João, however, performed quite a few unintelligible acts in both situations.

André produced some off topic comments and unintelligible acts during both interactions, although the rate of the first ones decreased from January (10) to July (4,8).

The Nuno/sister interaction corresponds to a very special situation, that will be further characterised in the following sub-chapter on communicative content. He produced many off topic acts, as well as his sister. Another very important factor to take in consideration is that 56,3% of his total communicative acts in January are unintelligible. These were slightly reduced in July, but still represent 36,5%.

Tables 6.16, 6.20 and 6.24 give the total number of communicative acts and the

duration of the videotaped sessions with the mothers/sister for Nuno, João and André, respectively. Tables 6.18, 6.22 and 6.26 present similar numbers for the adult's acts. From these data, rates of communicative acts were calculated. They are graphically summarised in Figure 7.9 below .

The overall results are similar to a certain degree to the situation encountered in the children/teacher interactions. The Nuno/sister exchange results are clearly different from the other two cases.

The interactions of João and André with their mothers reveal a pattern of clear domination by the adults, who score about twice the children's rate in three of the four sessions. Only in the case of André at the end of the study is this domination less clear.

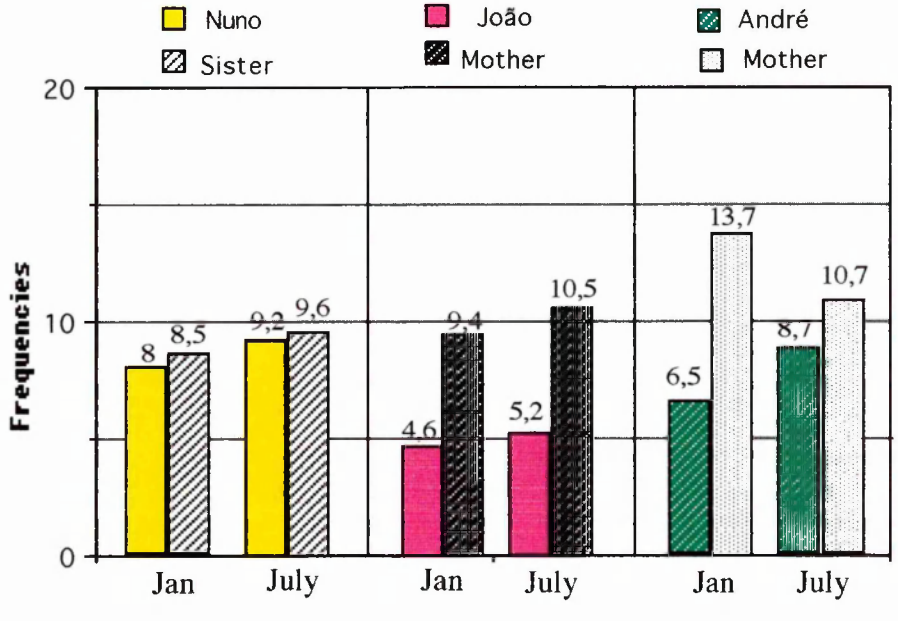


Figure 7.9: Rate of Communicative acts (per minute) for the Mothers/Sister and Children during the interactions in January and July.

In this case, the decrease of the mother's and the increase of the child's rate are consistent with the qualitative results obtained by interviewing the mother. She reported much higher expectations at the end of the study as to her son's abilities to participate in the story reading exchanges.

Nuno's communication rates were consistently higher than for the other two boys, and there is no domination of the exchange on the part of the adult. Two factors are probably responsible for this. On one hand, the above mentioned greater experience of Nuno on conversational interactions prompted him to try to intervene quite often in the exchange. Nuno had been working on developing his communicative skills for two years. He knew exactly what he was supposed to do and he understood the turn-taking game perfectly. By contrast, his sister was not at all experienced in this type of situation, and had difficulty in taking charge. Very little actual communication occurred, and she limited herself to reading the text in the story book, while the child unsuccessfully tried to participate, making unintelligible acts.

The mean of children's communicative acts per minute was 7,1, and 6,3 for only the two dyads involving João and André. This score is similar to the results presented in the study of Light et al. (1994), involving five dyads child/mother. They obtained a mean of 6,4 for interactions involving also story readings of a familiar and an unfamiliar book. In their study, however, the adult's rates of communicative acts were generally higher, averaging three times more than the children's ones, although varying wildly from dyad to dyad, from a minimum of around 1,5 to a maximum of 11. This is evidence that in this type of study the averaged results (the molar level, in the "chemical" terminology of Light et al.) should be taken cautiously. As seen above, the results presented here vary from very symmetric exchanges in the case of Nuno/sister to a maximum of twice the number of communicative acts of the adult in relation to the child.

Another difference to the results of Light et al. is that in our case the number of the child's communicative acts is consistently larger with the familiar book than with the unfamiliar one, while in their case there was no discernible tendency.

Finally, a curious feature in the above presented results is the overall higher number of communicative acts in the child/mother interactions (average of 7,1) than in the

child/teacher ones (average 5.,5). A partial explanation is the inherently slower pace of interaction through AAC devices, that were used in the July child/teacher sessions. Another reason might be that in the interaction with the teacher more time tends to be given to the child to express himself.

As to the turn taking participation patterns of mother/sister and children during interactions, results were given in Tables 6.19, 6.23, and 6.27, for Nuno/sister, João/mother and André/mother, respectively. Figure 7.10 below illustrates these results.

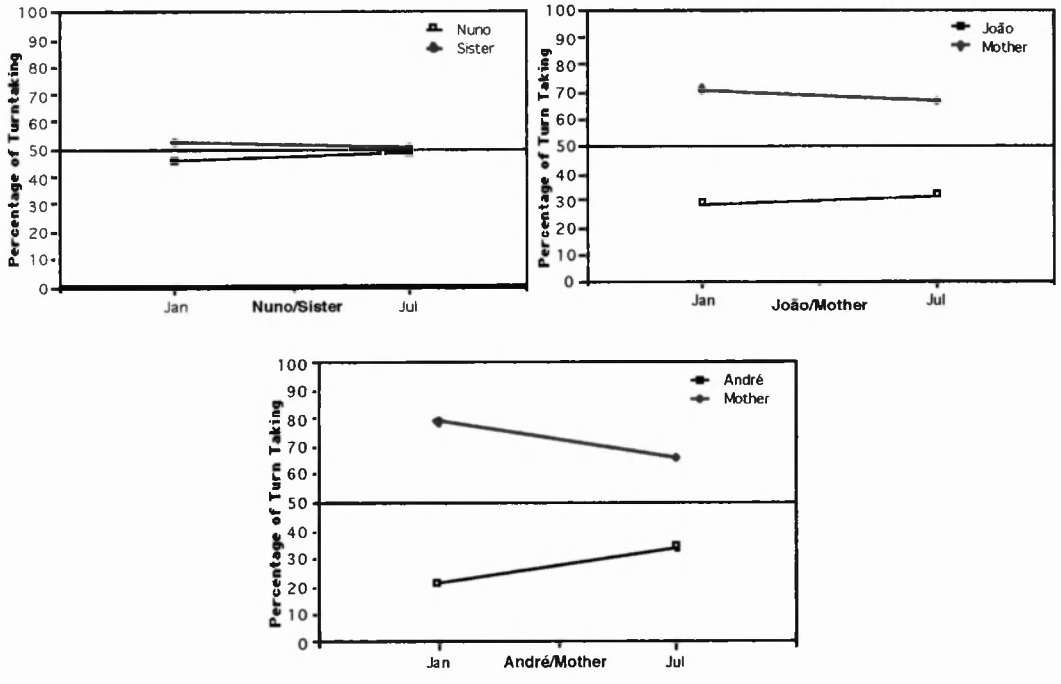


Figure 7.10: Percentage of Turn Taking Participation in the three Child/Mother Dyads in January and July.

The Nuno/sister interaction is very symmetric in both situations - the unfamiliar book in January and the familiar book in July. This was to be expected from the reasons given above to explain the relative number of communicative acts. In fact, although his sister was not even trying to understand him, he was making considerable effort to participate in the interaction. The videotapes and transcriptions clearly illustrate that he was carefully following the rules of turn-taking, taking his turn after his sister's. The turn taking participation of João and André are clearly asymmetric, forfeiting many of

their communication opportunities. There is a discernible improvement in the July sessions, when compared with what had happened in January. This improvement is more pronounced for André, who started from the most asymmetric situation in January.

This is in contrast with the turn taking participation in the interaction with the teacher, shown above, where João dramatically improved in this aspect of conversation competence, reaching a highly symmetric exchange with the familiar book in the July session. In fact, both João or André remain very far, in the interactions with their mothers, from the relatively balanced exchange with the teacher in the July sessions. These findings are consistent with the observations put forward in the above mentioned study of Light et al. (1994). They state that "the mothers provided few opportunities for the children to participate" and "tended to dominate the interactions, filling most of the conversational space and providing few openings for the children to participate".

In general manner the children increased their level of participation, either by producing more communicative acts, or by improving their turn taking participation in July, except for Nuno in the classroom context. In Nuno's case, his in-school participation rate, actually decreased. One possible explanation might be that the increased used of AAC techniques as a means of communication may have slowed down increases in communication rates. It may be safe to conclude that although AAC aided communication may be slower than the use of a natural modes, there is a need to investigate whether it offers an increase in clarity and effectiveness that might make up for its relative slowness.

These data lead to the need to further analyse the communicative content of interactions, keeping in mind that communication implies more than making communicative acts. These children's integration into society requires that they be able to make themselves understood by many different people in many different contexts.

7.2.1.3. Analysis of Communicative Content

Communicative content is intimately related to the quality of the communication in an exchange. In an effort to measure this essentially qualitative concept, the communicative acts of children and adults were categorised in section 6.3.1, emphasising those considered more relevant for emergent literacy development. The children's acts were distributed among 14 categories, labelled c1 to c14, while the adults' ones were classified according to 15 categories, labelled a1 to a15. These categories are described in detail in Appendix 5.

The children's categories comprised very simple acts, like "answering yes/no questions" (c2), complex ones, like "filling in a symbol, word or line" (c10), and even advanced types of behaviour, like "asking to read the text by himself" (c9), that denote self-confidence and a strong will to participate.

As to the adults' categories, they were also classified from the most simple type of behaviour, like "reading the text" (a9), to those that promote the participation of the child, like "encouraging the child to read" (a10).

The communicative profiles resulting from the distribution of the communicative acts among these categories are highly informative as to the quality of the exchange, and are the best indicators of the child's progress towards literacy acquisition. In order to build these profiles, the proportions (in percentage of total) of behaviours corresponding to each category in each videotaped session were calculated. The necessary basic results were the number of communicative acts listed in the tables provided in Chapter 6.

a) Child/Teacher Storybook Interaction: Communicative Content

Tables 6.1, 6.6 and 6.11 supply for Nuno, João, and André, respectively, the necessary numbers for the calculation of the proportions of acts distributed by the

fourteen categories used to classify the content of the children's communicative acts. With these data, the graphics of Figure 7.11 below were elaborated, where acts in each category are represented as percentages of the total number. These graphics are truly *communicative profiles* .

The same type of communicative profiles of the teacher's behaviour were collected from the data presented in Tables 6.4, 6.9 and 6.14, for the interactions with Nuno, João and André, respectively. They are shown in Figure 7.12.

Children's Communicative Profile

An examination of the profile corresponding to the interactions of Nuno with his teacher easily identifies that in January his performance was mainly related to turning the pages of the book (c7), as well as answering to yes/no questions (c2). In contrast, in July he performed a wide variety of acts such as predicting (c5), relating to his own experiences (c4), asking to point to pictures (c8) or to read the text (c9), and filling in words/sentences (c10). These last categories correspond to more complex tasks than the first ones, indicating a much higher quality of communicative content in the July interaction, with the familiar book, after the six months of intervention, than in the January session, with the unfamiliar book.

A great amount of his January communicative acts were considered off topic (c6), and these decreased in July (15,5% - 2,3%). The same happened to his unintelligible acts (c13), that decreased from 16,6% to 4,2%. Considered in category c14- others, were his intentions to continue the session when it was finished.

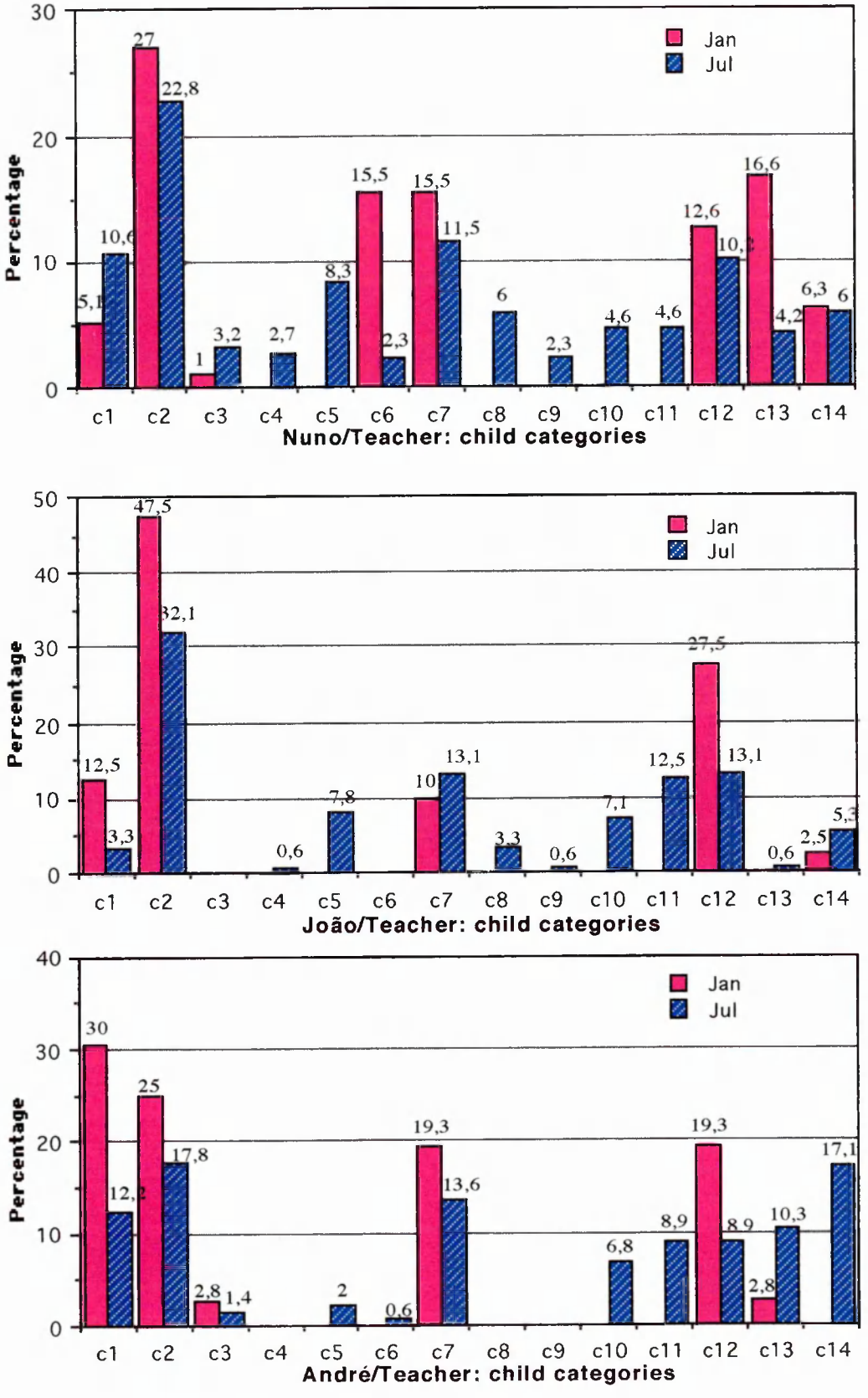


Figure 7.11: Communicative content profile of the January and July sessions of each child with the teacher

In the figure above, it is shown that in January João's performance was almost exclusively limited to responding to yes/no questions (c2 - 47,5%) and commenting or responding to the adult's open ended questions or comments (c1 - 12,5%). Turning the pages with the adult's support (c7 - 10%) and performing actions (c12 - 27,5%) were also important factors considered in his performance.

However, by July João was able to demonstrate his ability to perform a variety of items, such as making predictions about the text (c5 - 7,8%), filling in words or sentences (c10 - 7,1%), pretending to read (c11 - 12,5%), asking to point to pictures and words (c8 - 3,3%), and even once he asked to read the text by himself (c9). This last function "ask to read by himself" is of relevance and may suggest that he was coming to see himself as a possible reader. Some of these last functions, which enable children to actively participate during story reading activities (and therefore help in developing emergent literacy skills), are only possible through the use of different types of AAC aided techniques. An examination of table 6.8 indicates that João actually used AAC aided modes extensively in July, as discussed in section 7.2.1.1.

André demonstrated in the first video (January) that his communicative behaviour during the interaction (see Table 6.11) was restricted to making comments (c1 - 30%), most of them positive reactions to the adult's interactions. He answers to yes/no questions (c2) in 25% of the interaction, and in 19,3% he was performing actions (c12) as well as asking to turn the page (c7). Both last categories decreased in the July session, and categories related to the independent reading process, as filling in words or sentences (c10 - 6,8%) and reading the book with the teacher (c11 - 8,9%), took place.

An increase of unintelligible acts (c13) from 2,8% to 10,3% was also identified. This may have corresponded to a enhanced eagerness to communicate, exceeding his capabilities to be effective. The videotapes show that in July he kept his eyes on the book at all times, showing a lot of interest and concentration during the storybook

reading, as well as an understanding of the story itself.

An overall examination and comparison of the profiles shown in Figure 7.11 reveal a similar communicative pattern for all three children in the January sessions, with the unfamiliar storybook. Their significant communicative acts are almost exclusively distributed in the less complex categories c1 - labels or comments, c2 - answering yes/no questions, c7 - asking to turn the page, and c12 - performing actions. Nuno's pattern , once again, differs from those of the other two, because he produces many more off-topic (c6) and unintelligible (c13) acts. This may be however as much a question of personal style, as a consequence of his higher eagerness to communicate, for the reasons of better understanding of the mechanisms of communication explained above.

The profiles of the July interactions are unmistakable evidence of a strong progress in all three children's ability to communicate during the six months of intervention. The simpler acts of categories c1, c2, c7 and c12, correspond now to a markedly lower proportion of the total. Categories c5 - predictions, c8 - asking to point to the pictures or to the text, c10 - filling in a symbol, word or line, c11 - reading the book/sentence with the adult are now part of the communicative pattern for all the children. Some of these acts are only feasible in an environment where AAC aided resources are available. This is in agreement with the findings of section 7.2.1.1 on the substantial use of AAC as a form of communication by all three children in the July sessions with the teacher.

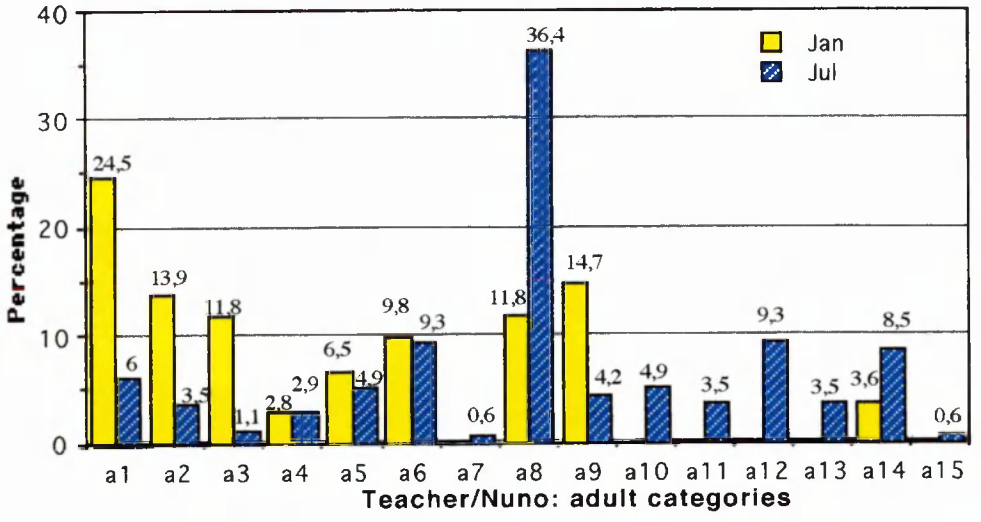
The differences in communicative capability between them are also more evident now; Nuno's profiles are obviously richer than João's, and João richer than André's.

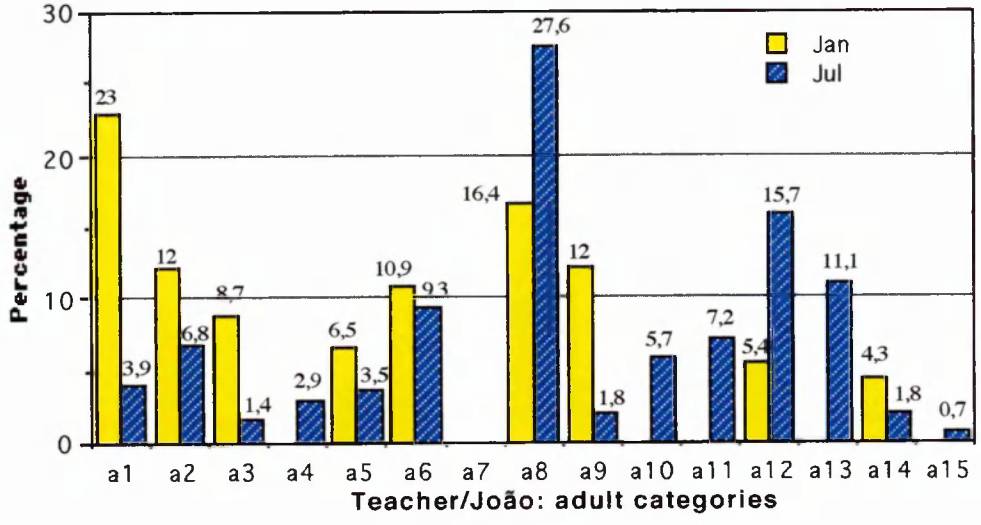
Teacher's Communicative Profile

The interaction with Nuno in January was very much based on reading the text of the story (a9), making comments or labelling (a1) and asking the child either yes/no (a2) or open ended (a3) questions. In July, the reading the text acts decreased from 14,7% to 4,2%, and were replaced by a diversity of behaviours leading the child to a more participative performance, such as encouraging the child to read (a10) or simultaneous reading (a11), pointing to symbols or words (a13), repeating (a14). Expanding on the child's communication attempts by asking for confirmation/ clarification (a8) became the dominant communicative act of the teacher in the July session (36,4%). This fact is strong evidence as well as providing additional support (a12) was also increased in July up to 9,3%.

The teacher's interaction with João was confined in January to reading the text (a9 - 12%), to make comments or labelling (a1 - 23%), and asking the child yes/no questions (a2 - 12%). The predominance of these categories of communicative acts considerably decreased in the July session. The teacher's need to ask for clarification or to confirm the child's communicative acts (a8), increased from 16,4% in January to 27,6% in July.

The introduction of different approaches in the July interaction can be identified. The teacher encourages the child to read (a10 - 5,7%), she uses simultaneous reading (a11 - 7,2%), she points to the symbols or words while speaking (a13 - 11%) and provides additional support (a12) in 15,7% of the interaction.





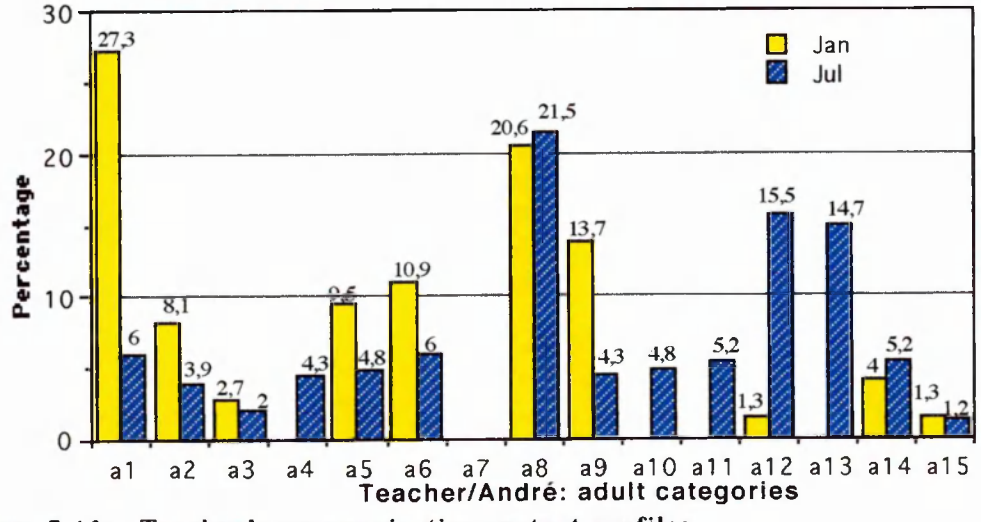


Figure 7.12: Teacher's communicative content profiles of the January and July sessions with each child.

In her interaction with André, again she makes many comments/labels (a1 - 27,3%), reads the text (a9 - 13,7%) and asks yes/no questions (a2 - 8,1%). Directing the child to turn the pages (a6) reduced from 11% (January) to 6% (July).

An important factor is that part of the time, the teacher did not allow enough time for the child to respond, however she did use many confirmations/expansions or clarifications (a8) in both January (20,6%) and July (21,5%) interactions. Some changes were found in the July interaction, as in pointing to symbols or words (a13 - 14,7%), providing additional support (a12), encouraging the child to read (a10), and simultaneously reading the text with the child (a11).

It can be concluded, by analysing the profiles of Figure 7.12, that the teacher's behaviour was very similar in the interaction with all three children. The main difference from the January to the July sessions is that the teacher's role changes from a dominant to a supportive one.

b) Child/Mother Storybook Reading Interaction: Communicative Content

Tables 6.16, 6.20 and 6.24 supply, for Nuno, João, and André, respectively, the necessary numbers for the calculation of the proportions of acts distributed by the fourteen categories used to classify the content of the children's communicative acts. With these data, the graphics of Figure 7.13 below were elaborated, where acts in each category are represented as percentages of the total number.

The communicative profiles of the mother/sister's behaviour were collected from the data presented in Tables 6.18, 6.22 and 6.26, for the interactions with Nuno, João and André, respectively. They are shown, also as percentages of totals, in Figure 7.14.

Children's Communicative Profile.

As previously mentioned in section 7.2., the storybook reading sessions of Nuno with his sister are much shorter than all the others. As already pointed out, the quantitative data taken from these sessions should therefore be viewed as much less reliable than for all the other interactions.

An examination of the profile corresponding to the interactions of Nuno with his sister, presented in Figure 7.13: above identifies a considerably high amount of unintelligible acts (c13 - 56,2%) in January, that increased in July (65,2%). Although they were unintelligible, it is probable that these acts have a meaning. In some of the cases, he is trying to participate in the interaction, in others, he is making fun of her way of telling the story, demonstrating a lot of criticism.

He makes many attempts in January to make her sister understand that he wants to look at the book, or to point at it (c8). He asks for external help (included in c14), he wanted us to show her how she should read the story, he was disappointed and made some off topic comments (c6 - 12,5%), but gave up, being satisfied with the simple fact that his sister was there, just reading a storybook to him.

However, his effort to be better understood by his sister improved in July, by increasing the use of various communicative modes simultaneously during those interactions and becoming very angry with the situation. Furthermore he was very critical of the way his sister was reading the story to him. He knew exactly what he could do during the story and his sister was not providing him, demonstrating his self-advocacy.

The videotapes also show that in July he kept his eyes on the book at all times, demonstrating an understanding of it, and a lot of interest and concentration during the story.

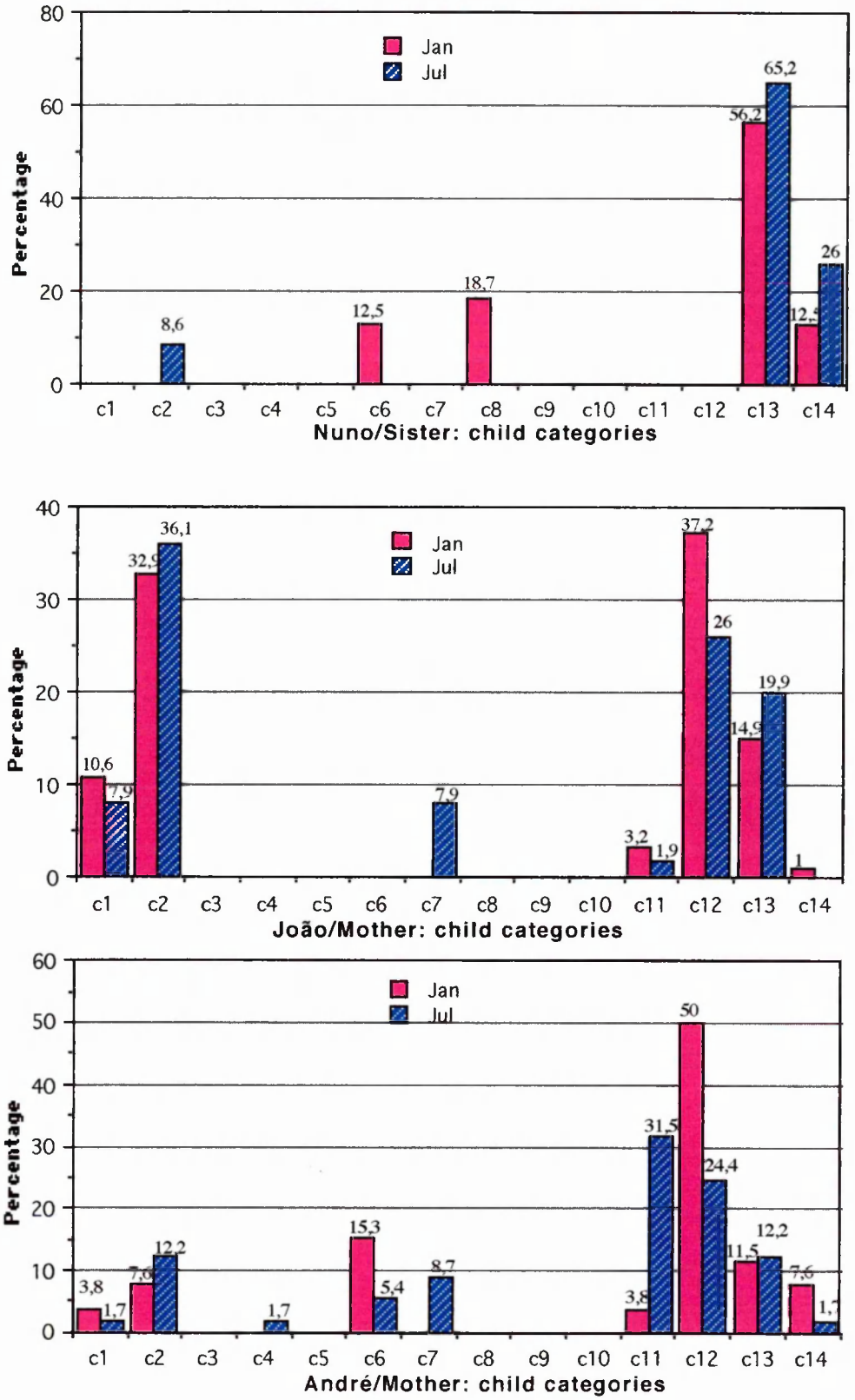


Figure 7.13: Communicative content profile of the January and July sessions of each child with their mothers/sister.

As to João's performance at home with his mother, many similarities can be found between the January and the July sessions. A great part of his performance consists of turning pages and lifting flaps (c12 - 37,2% in January to 26% in July) and answering to yes/no questions (c2 - 32,9% in January to 36,1% in July). It is important to point out that he was able to turn the pages most of the times without any help at all and he seemed very proud and self confident with the fact that his mother allowed him the time necessary to do it.

Asking to turn the pages of the book (c7 - 8%) was a novelty performed in July. His communicative acts in this category clearly show that João understood the mechanisms of book reading. After the right hand page was read, he immediately started moving his hand and fingers trying to turn the page in order to learn more about the story. He did not wait for his mother to ask him to do so. Furthermore, after turning the page he immediately looked at the left page and only after that one was read did he look to the right hand page, waiting for it to be read.

An important factor to be considered is the amount of unintelligible acts (c13) he performed in both January (15%) and July (20%) sessions. Some of these arise after his mother's pause, encouraging him to fill in a word. In many of these instances (67%) he vocalised, pretending he was saying a word. Although those acts were really unintelligible, his mother interpreted them as if he had said the correct word, providing him with important, positive feedback.

As to André, during the January interaction with his mother he was mostly involved in performing actions (c12), such as lifting flaps, representing 50% of his time. Many of the other categories were never performed by him. Only a few times did he answer to yes/no questions (c2 - 7,6%), a proportion that increased slightly in July to 12,3%.

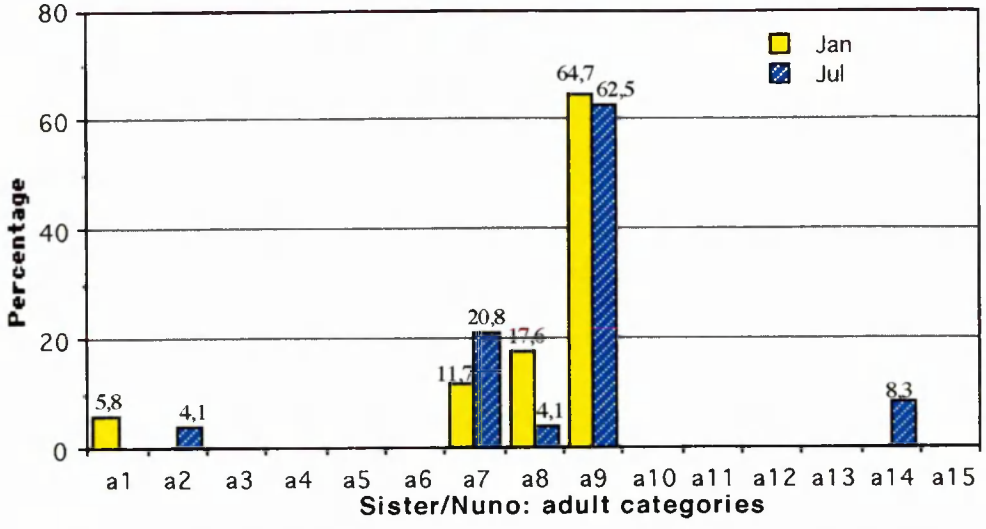
Although 15,4% of the time he looked away from the situation, and for that reason those acts have been considered as off topic (c6), it appeared that in July some of them

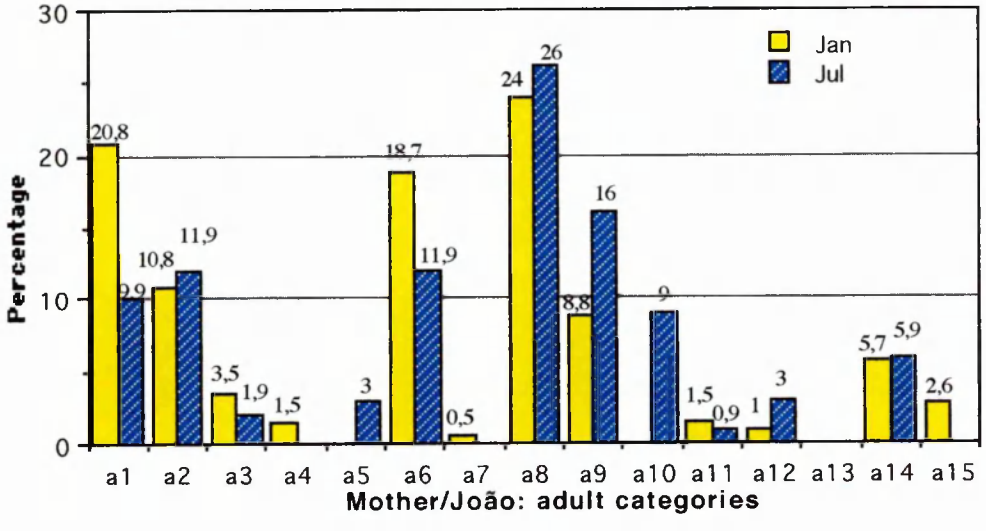
may have had a communicative intent (to want to turn the page, or to lift flaps). The percentage of these acts had considerably decreased in July, from 15,4% to 5,4%. By then, he was able to clearly ask to turn the page (c7 - 8,7%), and even once he was able to relate the story event to his own experience (c4). A positive change in his July performance is the fact that in 31,5% of the interactions, he was engaged in simultaneous reading with his mother (c11) rather than just listening to her.

As a conclusion to the analysis of the communicative content of the children's interaction with their mothers, it may be said that Nuno is again quite different from his other two colleagues for the reasons presented in section 7.2.1.2, about communicative use patterns. João and André's activity consisted mainly of answers to yes/no questions (c2) and performing actions (c12), like turning pages supported by their mothers, classes of simple communicative acts that denote a strongly dominant role of their mothers in the exchange. It is important to note that AAC devices were not used by the children either in January or July, forcing them to rely on their mothers' inter mediation for any more complex type of communication. As pointed out in the individual description above and discussed below in the description of the mothers' behaviour, some of the yes/no answers and actions performed in the July sessions corresponded in fact to complex communicative acts, like answering to open-ended questions, relating to experience, asking to turn pages or pointing to pictures.

Mothers/Sister's Communicative Profile

The performance of the mothers in the case of João and André, and the sister, in the case of Nuno, was very different in all three situations. It also changed across the six months in completely different ways as illustrated in the next figures.





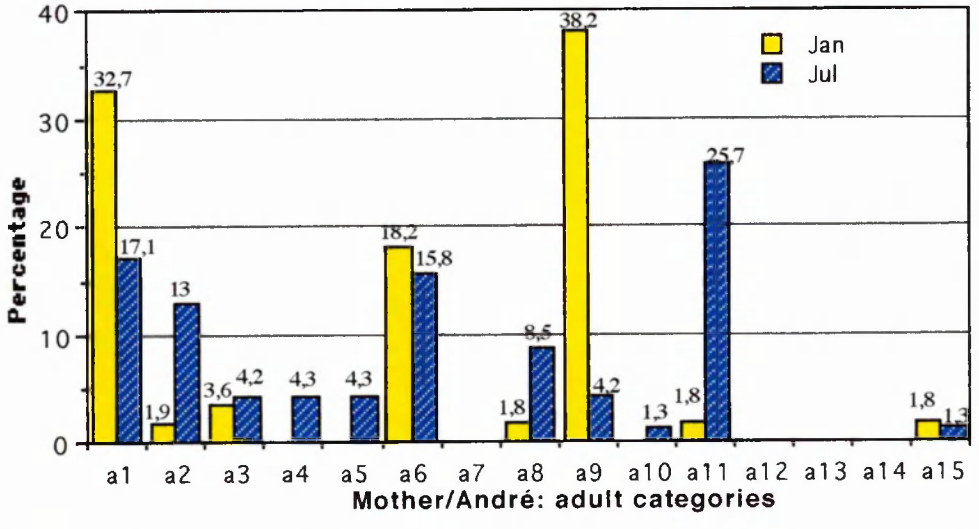


Figure 7.14: Mother/sister's communicative content profiles of the January and July sessions with each child.

Nuno's sister's behaviour was very similar both in January and July story book reading interactions, as can be easily identified by observing the first graphic presented in figure 7.14 above. She limited her behaviour to reading the written content of the pages (a9 - 64,7% in Jan. and 62,5% in July). The remainder of the interaction is dominated by off-topic comments.

As to João's mother approach, it was very appropriate in both situations. She was very calm and secure. She asked him a lot of questions (a2 and a3) to encourage João to actively participate during the session representing 14% of the interaction both in January and July. She understood that when she asked him open-ended questions (a2), or asked him to predict what was going to happen next (a5), the only way he was able to respond was by providing him with a yes/no question after that.

She allowed him sufficient time to answer her questions, or to turn the pages or point to events in the book. The support she provided him was appropriate to his needs, since he likes to do things by himself, but he wants to be sure that he is expected to do it and that nobody is rushing him.

She did a lot of confirmations and expanded on João's communication , or asked for clarification when needed (a8 - 24% and 26%). In July she introduced some new approaches, such as encouraging her son to become involved in interpreting the text (a10 - 9%), and to anticipate story events (a5 - 3%).

A great change was found in André's mother performance when comparing the January and the July interactions. At the first one, she almost limited her behaviour to reading the text (a9 - 38,2%), while in July she did it only for 4,2%. Instead she did simultaneous reading with her child (a11) in 25,7% of the interaction.

She makes many comments or labels (a1) in January, an act that decreased in July (32,7% to 17,1%). She uses few open ended questions (a3 - 3,6%) as well as yes/no questions (a2 - 1,9%) in January. The latest increased in July to 13%, a fact that may

be related to her new strategy of allowing her son to participate by simply responding yes or no.

She uses a lot of directives (a6) in both situations (18,2% and 15,8%), although in July she introduced some new behaviours, like relating to the child's own experience (a4 - 4,3%) as well as predicting (a5 - 4,3%) and even once she encouraged her son to read (a10).

It can be identified that in January the few questions or opportunities she provided to her son to participate were immediately answered by herself, not demonstrating any expectation of his ability to do it. In contrast, a positive attitude was demonstrated by her at the July session, where she paused a few times to indicate to André his turn to participate. Nevertheless she did not allow him enough time for him to be able to respond, which means that he forfeited many of his opportunities to participate. Related to her expectations may be her use of confirmations/expansions or requesting clarification (a8) that was rare in January (1,8%) and increased up to 8,5% in July.

It is not easy to compare these findings with those of the study of Light et al. (1994) These authors have also divided the communicative acts into various categories, ten for those of children and another ten for those of the mothers. They are fewer than in the work presented in this thesis, and there is therefore limited superposition. Where there is some, it is curious to note that there was, in the Light et al. study, a decrease in the category "labels and comments" from the reading of the unfamiliar to the familiar book - as in this study with the mothers of João and André. On the other hand, they report a marked increase in the "reading the text " category from the unfamiliar to the familiar book for four out of the five cases they observed, while in this study it was the sharp decrease in André's mother reading the text of the familiar book that is most striking.

7. 3. Communicative Form, Use and Content: Conclusions

This study was designed to emphasise the pragmatic aspects of augmentative and alternative communication interaction, that is to say, the integration of form, use and content of AAC systems. The division of the communicative process into form, use and content provides a useful framework of analysis, as seen in the last three sub-chapters. Communicative content is, of course, the most important aspect of the three, but the overall process for children with SSPI cannot be properly evaluated without consideration of the other two components.

The results of this study were analysed according to Light et al. (1994) at both group level and individual one. Nevertheless, the large number of variables, together with the case study nature of the project, combined to make the individual results more relevant. The variability of each child's results reflects his unique combination of skills and challenges and it is very important to be able study them in relationship to his individual characteristics and communicative level. This is especially noticeable in the striking differences between the results for the two dyads where Nuno participated with those for the other four dyads, involving João and André.

This study indicates that the children's primary mode of communication will depend critically on their own physical disabilities. If they are deprived of an enhanced means of communicating such as the use of AAC techniques, they are restricted to communicate in their natural modes, which appear to be less effective. The categories used in this study, "eye gaze, facial and body expressions" on one side and "vocalisations" on the other seemed to be used in mixed proportions that depended on each child's personal style.

The use of AAC aided communication was introduced in the classroom interaction with the teacher after the initial phase of this intervention study. It was a very

important new factor in the final phase, since it became a primary mode of communication in July. In their interaction with the teacher, the children assumed a much more active role at the end of the intervention, in the July sessions, than at the beginning.

The results presented in Tables 6.3, 6.8 and 6.13, for Nuno, João and André, respectively, combine communicative form with content. Based on them, a calculation was made of the proportion of use, in the July sessions with the teacher, of each of the three above mentioned modes - "eye gaze, facial and body expression", "vocalisations" and "AAC aided systems" -for each category of communicative acts from c1 to c5, c7 to c10, and c13 (as explained in chapter 6, categories c6 - off topic comments, c11- simultaneous reading, c12 - performing actions and c14 - others were considered not relevant for this analysis). The diagrams of Figure 7.15 below are illustrative of that distribution. It is apparent from this Figure that most of the acts performed by the three children are in categories c4 - relating story to experience, c5 - predicting, c7 - asking to turn the page, c8 - asking to point to pictures or to the text, c9 - asking to read the text by himself, and c10 - filling in a symbol, word or line, use AAC aided systems.

An examination of Figures 7.11 and 7.13 immediately demonstrates that these more complex categories of communicative acts are the least performed in the January sessions with the teacher and in the sessions with the mothers, where AAC devices were not made available. The classroom situation in July proved that, when provided with assistive technology, children can answer open-ended questions or predict and tell precisely what they mean without the adult having to use the yes/no strategy. Thus it is shown that assistive technology enhances the form, use and content of their communication, which should be one of the major goals for children with SSPI.

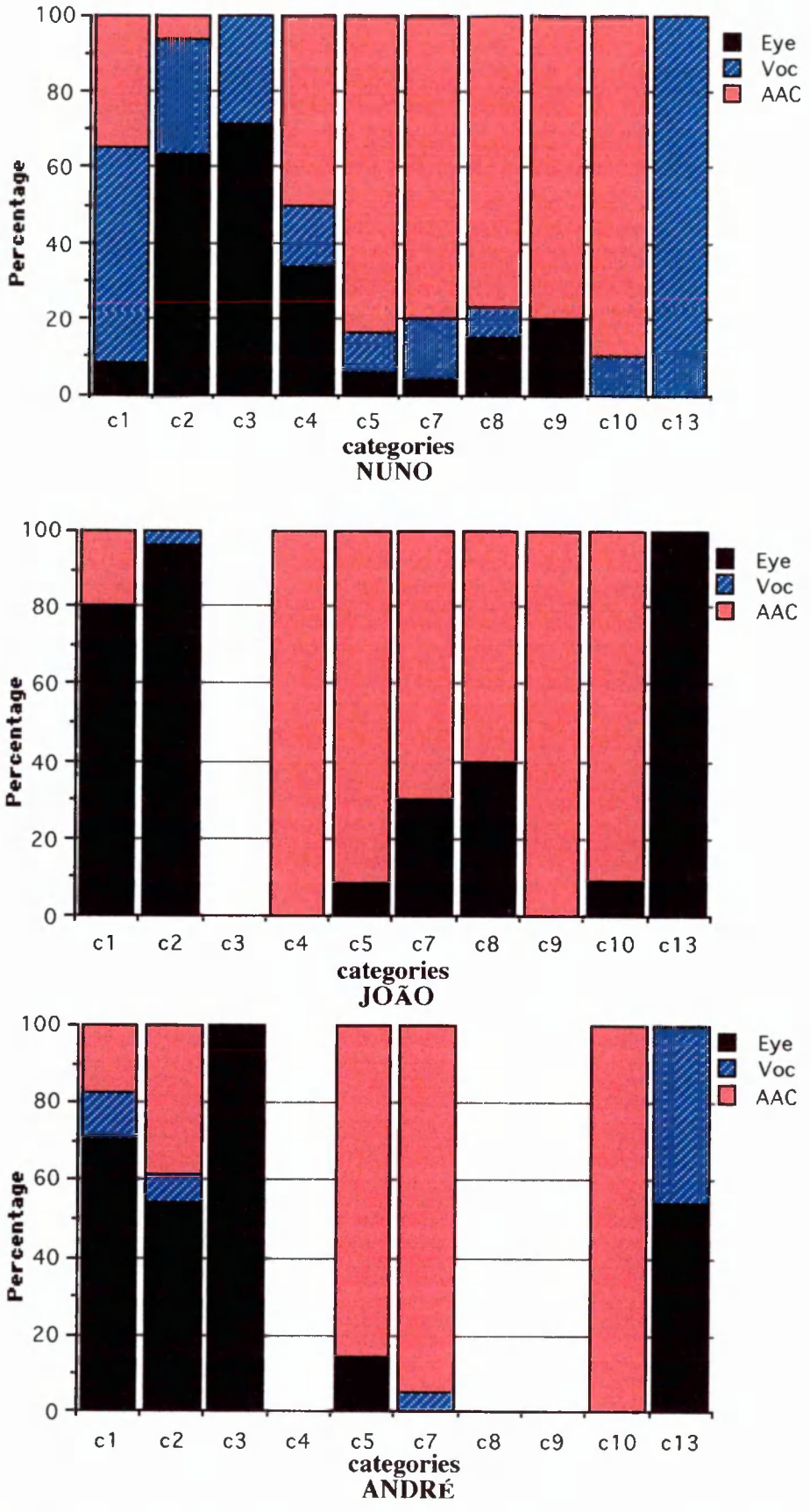


Figure 7.15: Percentage of Modes used by Nuno, João and André in each communicative act category, in July interaction with the teacher.

AAC aided communication may however be slower than the use of a natural modes, and there is a need to investigate whether it offers an increase in clarity and effectiveness that might make up for its relative slowness. This study seems to supply evidence that this increase is truly compensatory.

Communicative use, either rates communication or turn taking capabilities, is especially important in the analysis of sessions where the communicative content is poor. This was the case of Nuno's interactions with his sister, where he demonstrated an advanced knowledge of the turn taking rules in a context where very little actual communication occurred. Turn taking can also be an important indicator of progress in communication capabilities, as in the case of the differences between the initial and the final sessions for João with the teacher, and for André with his mother.

On the other hand, a comparison of the turn taking patterns of both João and André in their interactions with the mothers and with the teacher gives additional evidence for the importance of AAC aided systems. In fact, while the interactions with their mothers remain, in the last sessions in July, very asymmetric, the exchange with the teacher, where AAC aided systems were available to them, is much more balanced.

The study of Light et al. (1994) with five child/mother dyads supplies data on storybook reading interactions that may be compared with some of the data obtained in this study. The results of the studies are consistent in some cases and disagree in some others. A significant difference seems to be that in our case the number of child's communicative acts is consistently larger with the familiar book than with the unfamiliar one, while in their case there was no discernible tendency. The most important similarity is probably that in both studies the mothers did not provide the children with access to their aided AAC systems. This is also consistent with the earlier results of a survey of parents of children with SSPI, reported by Light and Kelford Smith (1993), where the overwhelming majority of parents indicated that their children did not use their aided AAC systems during storybook reading.

7. 4. Discussion of Results in Relation with the Research Questions.

We must continue to build our research base, and work together with parents, people who use AAC techniques and other professionals to collaborate in a way that lets each of us capitalise on our strengths rather than become frustrated by our weaknesses.

Pat Mirenda, 1992, Phonic Ear Lecture

The following sections will address the research questions that were formulated at the beginning of this study, relating them to issues identified in the literature review, and to the results discussed.

7.4.1. Question I: *Does participation in storyreading interactions improve children's opportunities to become "emergent readers and writers"?*

As seen in sub-chapter 2.5.8, numerous authors have highlighted the importance of interactive storybook reading experiences as critical in the development of literacy skills in young children. Supplying evidence to validate the hypothesis that "*the use of AAC techniques in storytelling achievement can provide emergent literacy experiences, which can promote the development of literacy in children with SSPI* " was a main objective of the study presented here. Although there are many aspects to this hypothesis, this study focused on only one issue within the confines of it.

The above mentioned research on the effects of storybook reading programs for literacy development with at-risk preschool students suggests that children should be actively involved in story reading processes in order to take advantage from them. There is therefore, a problem of the participation level of the children.

A research question emerged as a result:

- ***Does participation in storyreading activities improve children's opportunities to develop emergent literacy skills?***

In the course of this study, several types of results were obtained that may contribute to an answer to this question. The first set that may be used are the qualitative results presented in section 6.2. The interviews with the mothers provide considerable evidence as to a higher increased participation level by the children in the storybook reading process at the end of the study.

As mentioned before, Nuno achieved most of the goals designed for him during the school year. He showed great improvement in his ability to participate in increasingly complex classroom activities, managing to finish them without becoming distracted or de-motivated. He became able to identify his own printed name as well as those of his classmates. His favourite activity at home became storybooks read to him by his sister. His sister, in turn, appeared to become very interested in her participation in the study.

As to João, his mother indicated that by the end of the intervention he was better able to answer a large variety of yes/no questions, his comprehension abilities had improved considerably, and he had become able to "talk" about things that had happened to him, or which he was involved in during the school day. Contributing to these new social abilities was his increased knowledge of how to wait for his turn during play without interrupting inappropriately.

As to the storybook that was sent home to be read to João at the end of the study, his mother commented that he immediately demonstrated a higher enthusiasm when she showed him the book and proceeded to demonstrate his familiarity with the story. She noticed that João was able to predict what was going to happen and that he participated more than when she read unfamiliar books, in which case he became more expectant.

Professional opinions echoed those of João's parents. At school, as well as at home, João's performance had greatly improved. Among other advances, he had come to understand turn taking and had otherwise improved his peer interactions.

André's mother described significant generalised improvement in her son. She considers that his improvements are as much related to his behaviour, as they are to his cognitive abilities.

André's mother also noticed an improvement in his social skills. She reported his ability to take turns in interaction had improved, while he was also able to spontaneously request objects or actions outside his immediate environment. He was more able to initiate, maintain and pay attention to conversations. All of these changes had contributed to more frequent play with other children, and in all-round better quality peer interactions. The professionals at the Centre thought he was able to perform more complex tasks with greater motivation and for longer periods of time.

The scores obtained by João and André in the Reynell Verbal Comprehension Tests support those conclusions. Figures 6.2 and 6.3 show a clear positive inflection for both children during the intervention period.

The quantitative results obtained by analysis of the videotapes, presented in section 6.3 and discussed in section 7.2.1., also corroborate these findings. The most important evidence is given by the communicative content profiles presented in 7.2.1.3. These profiles give distributions of communicative acts by categories that were adapted from the literature in order to emphasise those considered important for literacy development, and as mentioned before, are highly informative as to the quality of the exchange, and are the best indicators of the child's progress towards literacy acquisition.

An overall examination and comparison of the profiles in the January sessions with the teacher reveals that all three children, where the storybooks read were unfamiliar to

them, produce significant communicative acts that are almost exclusively distributed across the less complex categories.

As mentioned before, the profiles of the July interactions, with a familiar book, are unmistakable evidence of a strong progress in the children's ability to communicate during the six months of intervention. Their participation is more active, as they perform more complex tasks, related to a higher level of understanding of literacy codes. Consequently, from the January to the July sessions the teacher's role changes from a dominant to a supportive one.

The children's turn taking participation may also be seen as a vital literacy competence that changed significantly during the intervention period. As mentioned above, Nuno was already acquainted with the classroom environment in January, and therefore the notion of turn taking opportunity was familiar to him by then. The role of the teacher in the January session was therefore not markedly dominant, and the exchange was already very symmetrical at the beginning of the study. In the other two cases, the children's turn taking participation was most asymmetrical in January, but, at least in the case of João, there was a very striking progress resulting from the intervention programme.

The interactions with the teacher do not provide such clear-cut evidence as to the rates of communicative acts. In this respect, the participation was dominated by the adult, a finding consistent with earlier studies (Harris, 1982; Light, 1985; Light et al 1994). However, if in the interactions with João and André the teacher produced on average approximately two times as many acts as her students, that was not the case with Nuno. The teacher's participation was not as dominant as in the other two cases, rating less than 50% more acts than the child. This was interpreted as a consequence of Nuno had been longer in this class group, being much more acquainted from the start with communication in story reading events.

It may be said that a body of evidence has been assembled in this study that points to

the following answer to the above mentioned research question:

- **Intervention programmes can indeed be implemented that lead to substantial progress in children's participation in story time, with the consequent development of early literacy skills.**

These findings are contributions to the validation of the hypothesis that a well designed story reading programme can significantly contribute to the development of emergent literacy skills in children with SSPI, and to the development of the content, form and use of their communication. They should not, however, be understood as a validation of any kind of story reading.

As Teale and Sulzby (1987) stated, what the adult and child talk about in the interaction holds the key to the effects of storybook reading. Reading a book to a child with SSPI is certainly not sufficient for maximum literacy growth. Rather it is the "talk" that surrounds the text that is read that may be the key. In fact, previous research on children that are AAC users (Light, Binger, & Kelford-Smith, 1994; Light & Kelford-Smith, 1993; Pierce & McWilliam, 1993) indicates that the storybook reading experiences of these children are quite discouraging.

The study presented here, therefore, concludes that, with appropriate intervention strategies, students with SSPI can progress not only in developing emergent literacy behaviours during storybook readings, but they can also be expected to become more independent in reading the book presented to them, while the teacher is able to reduce her performance to monitoring the child's progress.

7.4.2. Question II: Can AAC techniques be used to enhance participation by children with SSPI in story based activities?

As already stated in Chapter 2, research does exist demonstrating that AAC approaches can help promote literacy development in children with learning disabilities (Burckhart, 1993; Carpenter, 1985; Teale and Sulzby, 1986; Strickland and Morrow, 1989; King De-Baun, 1990; Coleman, 1991; Coleman, Koppenhaver & Yoder, 1991; Koppenhaver, Coleman, Kalman & Yoder, 1991; Musselwhite & King De-Baun, 1993; Nunes da Ponte & Azevedo, 1993). However most of these authors do not present quantitative evidence of the relationship between AAC use and early literacy acquisition.

It was an objective of this study to collect data that might contribute to the validation of the hypothesis that ***the use of AAC techniques in storytelling achievement, can provide emergent literacy experiences, which can promote the development of literacy in children with SSPI.*** With this goal in mind, two factors were considered. The first one addressed once again the problem of increasing the children's participation, a central problem for children with SSPI. The second relates to the use of graphic symbols in storybook reading, a strategy that has been convincingly defended by King-deBaun (1990, 1993). She argued that adapting books with symbols and providing the child with communication displays offer opportunities for children to become immediately successful in his/her early book reading experiences.

The results collected in respect of these objectives refer only to the classroom based interactions with the teacher. In fact only in these situations were AAC techniques made available to the children. As pointed out in Chapter 4, at the beginning of this study Nuno was already familiar with AAC aided communication. He was not, however, able to use symbols effectively yet due to physical restraints on reaching and manipulating the aids. The other two children, João and André, had their first

exposure to AAC within the context of the study and at the beginning were not yet able to use symbols in any functional way.

The data that may be first mentioned in relation to AAC use refer to Communicative Form. This was presented in Chapter 6 and discussed in sub-chapter 7.2.1.1. Figures 7.1, 7.2 and 7.3 show how AAC became an extremely important mode of communication at the end of this study for the three children involved. Nuno, João and André used this mode of communication in 44%, 39% and 50%, respectively, of their communicative acts in the July final storybook reading sessions. These figures are remarkably high for the last two children, since it was the first time that they had benefited from an AAC based intervention. It may be said that the same children, after a period of six months of an AAC based intervention, clearly relied on AAC systems to communicate. Even more revealing were the results of the distribution of acts in each communicative category by the different modes available to each child expressed graphically in Figure 7.15. It is apparent from this Figure that most of the acts performed by the three children using AAC are in categories that correspond to complex communicative contents, like relating story to own experience, predicting what will happen next, asking to read the text by himself, or filling in a symbol, word or line .

An examination of Figures 7.11 and 7.13 immediately demonstrates that these more complex categories of communicative acts are the least performed in the January sessions with the teacher and in the sessions with the mothers, where AAC techniques were not made available. The classroom situation in July showed that, when provided with assistive technology, children can answer open-ended questions or predict about the text and tell precisely what they mean without the adult having to use the yes/no strategy. The children assumed a much more active role at the end of the intervention, in the July sessions, than at the beginning. Thus it is shown that assistive technology enhances the form, use and content of their communication, and promotes a much richer participation in the storybook reading sessions.

The use of graphic symbols in the context of storybooks was documented in Chapter 5. In particular, the description of the final phase of the intervention, in section 5.3.5, contains ample evidence to document the usefulness of the utilisation of technologically accessible graphic symbols in storybook reading interactions.

When an already familiar book was used, each child was able to choose symbol words and sentences, which they accessed via eye gazing on an Etran or by a Dial Scan. This vocabulary, examples of which are shown in Figures 5.12 and 5.13, was specially selected to enable children to anticipate, to fill-in, using symbols, to relate with their own experiences, to ask to turn the page, and to comment on the book. Figure 5.14 gives a thorough account of the accomplishments of each child in successfully choosing correct graphic symbol sentences, matching those of the storybook, during the final July session. These choices amount to real "reading independently" acts and demonstrate emergent competency in literacy.

These findings are corroborated by João´s mother testimony. She found that the combination of symbol format and text helped both her and João in the reading process. She was even surprised to discover how such very simple stories could be so interesting for children as opposed to more complex stories with more information, complicated texts, pictures and events.

It may be concluded that this study points to the following answers to the above mentioned research question:

- **Assistive technology may indeed be vital for children with SSPI to be able to participate in literacy related events at their highest possible level of engagement.**

- **Graphic symbols used in an appropriately designed intervention program may provide the first real opportunity for "independent reading".**

These conclusions are in accordance with those of Carpenter (1990), who states that it is possible for children with SSPI to achieve in the early stages of literacy development, although they approach the tasks at hand in a different manner from their peers in mainstream education. In a similar fashion, Coleman, Koppenhaver & Yoder (1991), argue that the child must have an appropriate way to access these tasks and must be given opportunities to use his or her optimal modes of communication

In fact, communication boards for stories should be constructed so that children with SSPI can ask and answer questions and retell stories to develop their language and literacy-related skills. We must get the assistive technology that is currently available to children with SSPI in their homes and preschool settings, so that they may develop their emerging literacy skills while also developing their ability to use this technology.

7.4.3. Observation of storyreading activities in the home setting.

As stated by Blackstone (1994), research that specifically addresses the family's involvement in AAC is lacking. For this reason the design of the study included the promotion of sessions of storybook reading involving the mothers or significant others, in parallel with the classroom sessions. The purpose of this analysis was to observe whether the improvement of the children's communicative competencies observed at school might be simultaneously observed at home.

The design of this part of the study was essentially inspired by the recent publication of Light, Binger & Kelford Smith (1994) about mother/child interactions during storybook reading. These authors obtained a great variety of data on the characteristics of this type of interaction. However no relationship was established with the school situation of the children in their research cohort.

The interviews with the mothers provide much evidence as to a much increased

participation level of the children in the storybook reading process at the end of the study. João's mother said that by the end of the program she had become more comfortable with the amount of her child's communication attempts. She witnessed a greater interest and participation on his part. She also concluded that his performance was significantly enhanced when the same story was read to him over and over again.

As to André's mother, she was pleased at the end of the study with the enhancement of the quality of her interaction with her child. This improvement led her to want to increase the time they spent in story reading activities. She reported much higher expectations of her son at the end of this study than at the beginning.

This positive correlation between the mothers' feelings and the children's progress at school was not however confirmed by the communicative profiles resulting from the analysis of the videotaped sessions.

Analysis of the communicative modes used by the children or of rates of communicative acts fails to detect meaningful differences between the January and the July sessions. The turn taking patterns of João and André with their mothers reveal, on the other hand, a clear domination of the exchange by the adults. Although there is a discernible improvement in the July sessions, when compared with what had happened in January (more pronounced for André), the children's turn taking participation is clearly asymmetric, forfeiting many of their communication opportunities.

The communicative content profiles of figures 7.13 and 7.14 do not show either the degree of improvement in the children's communicative abilities that resulted from the comparison between the initial and final sessions with the teacher at school. The children's activity consisted mainly of answers to yes/no questions and performing actions, like turning pages supported by their mothers, classes of simple communicative acts that denote a strongly dominant role of their mothers in the exchange.

It should be remarked that some of the yes/no answers and actions performed in the July sessions corresponded in fact to complex communicative acts, like answering to open-ended questions, relating experiences, asking to turn pages or pointing to pictures. In fact, it was found that none of the mothers provided their children with access to an AAC aided system during the story reading, either in January or in July, forcing them to rely on their mothers' inter mediation for any more complex type of communication. Mothers mentioned that it was very difficult to use a communication board at the same time as they were holding the child and reading the storybook. João's mother stated that she did not use his symbol communication board because she found it very limited and unsuited to his home communicative needs and interests.

This reluctance to use AAC at home is consistent with studies of Light, Binger & Kelford Smith (1994), and Light & Kelford Smith (1993), in which none of the children that participated were provided by their family with access to their AAC systems during the storybook reading interactions.

It may consequently be concluded that a progress in communication competence and emergent literacy acquisition was qualitatively registered by the mothers in the home sessions alongside the classroom intervention process. This progress had only reduced impact in the quantitative data taken from the videotaped sessions with the mothers because, in contrast to what happened in the interaction with the teacher, the children were not empowered by access to AAC.

It emerges from these findings that, the improvement of communicative skills in the classroom does not automatically transfer to the interaction with the mothers. This conclusion is all the more important because previous research has emphasised the critical role of the families in literacy acquisition for children with SSPI. Koppenhaver, Evans & Yoder (1991), for instance, surveyed the successful literacy experiences of 22 literate individuals with cerebral palsy, and concluded that more than the educational system, they credited their success to the combination of their own

talents and persistence, together with the support and high expectations of their parents.

Of course, the greater relative importance of home support for literacy in AAC users does not reduce the role of the educational institution. Light and Kelford-Smith (1993) support a collaborative model of literacy intervention for preschoolers using AAC systems, with home and school working together.

In fact, although the importance of literacy in early intervention is becoming increasingly evident, parents and professionals lack the necessary training, materials, and support to provide effective early literacy experiences for children with SSPI. Using AAC effectively in emergent literacy events takes much training. Trying to support a child and hold a book so both child and parent can see to read can be a great difficulty on its own. It can also be extremely difficult for parents to understand their children's communication attempts.

These barriers can substantially decrease the growth and development of language that occurs during storybook reading. Young children with severe physical and/or communication difficulties often do not have the language to comment on the text, the pictures and/or their personal experiences during the reading of a story, so they become listeners rather than active participants. An obvious solution would be to add augmentative communication strategies to the story reading process.

According to Buckley (1994), a parent driven programme should give parents an understanding of their child's particular needs and learning difficulties with the hope that this will enable them to interact with the child more effectively and sensitively in all their usual everyday activities together. In this way professionals may provide the proper information to allow them to make informed decisions. In conclusion, a commitment is necessary to working with parents as primary clients and to creating positive expectations together with respect for their views and preferences.

Chapter 8: Conclusions

8.1. Critical Comments

"Research is the vehicle that carries us along the road to knowing. The vehicle is fuelled by our excitement and commitment. However it is also fuelled by our failures (or less than optimal outcomes) and by our problems. A problem after all, can be seen as an opportunity for a creative solution."

Blackstone, 1993

Case study methodology was used in this study in order to allow an examination of the children's process of change. An evaluation of the intervention based on data from before and after the intervention was considerably enhanced by the inclusion of the case studies of the intervention process, which examine what the intervention actually meant in the lives of the participants as it occured.

In current days, teachers are called upon to perform in many different fields, working with children, producing materials, training classroom professionals to use different approaches, and helping parents and families to better manage their children. Simultaneously, they have to up-date their skills and knowledge in relation to the advance of new technologies. There is a great risk of using up their energy "doing", leaving little time or energy for "thinking" and "reflecting" about what we are doing and why.

The opportunity given to the researcher to investigate her own practice was a very positive side of this study, which will strongly influence her professional work in the future. Nevertheless, the role of being simultaneously a teacher and a researcher was found to be a very difficult one. To perform the two roles simultaneously, what is called as "dual practitioner-researcher role", is sometimes a very difficult task. It is hard for a teacher to look at her students or even at their achievements without being

psychologically involved, even through trying to be as much objective as possible.

In this particular study, by using case study methodology, an holistic overview of the children was compiled which enabled the communication patterns and domains of the children to be related to the research questions, and to the child's daily life-cycle. This ability to describe change allows qualitative and case study research design to address what Robson (1993) has termed clinical significance (when a specific treatment on an individual has produced a substantial effect).

The group of children used in this study was considered to be a very important component. Although they had many characteristics in common, they were at different ability levels, at the commencement of the study. Not only were the group important in this case, but also the environment in which this study took place, affording the researcher the use of different assistive technologies, already familiar to her.

The prime method of data collection used in this study, videotaping, was a useful and reliable tool, not only as a reliable source of data for analysis, but also to be further used with the parents and other professionals for training purposes. All of the intervention sessions were videotaped, which means that approximately thirteen hours of intervention was recorded which can be further used for professional training as well as for parental support. At the end of this study all the three families were given a videocassette that illustrated their child's performance with the researcher at the Centre, both in January at the beginning of the study and in July, at the end of it. Families mentioned how important it was for them to see with "their eyes" what their son was really capable of doing, and the positive influence it had on other family members.

Although the video records are considered as a useful tool for research, they should be used with caution for the training of professionals and parents. A "transplant approach" has to be avoided specially with parents. Rather it should be a process of modelling, sharing the video with them, discussing issues, asking questions about what they observed, gently encouraging the parents to say what they saw that they

would like to try with their child.

One of the disadvantages of using the videotape records is the amount of time needed for transcription, and the amount of data that can be further analysed. In this particular study all sessions during the six months were observed in order to allow a good description of the strategies and materials used during the intervention. Only the pre- and post-intervention sessions were fully transcribed and analysed by different coding categories. Nevertheless much more could be studied by in depth analysis of other issues during the intervention, but this was outside the scope of the current study, especially because of time constraints.

Although results of this study indicate very positive changes in all the three students, the duration of the study (six months) was probably one of its weaknesses, since their outcomes should be measured again over some time. Similarly, students have a school calendar that could not be changed for the research purposes of this study.

The category system used to analyse the video transcriptions was in the end found to be too long and some of the acts were difficult to classify in a accurate category. This system could indeed be improved with fewer categories.

There are two prime difficulties of the quantitative data analysis- the accurate identification of a communicative turn, and the identification of all, and only, intentionally communicative gestures. These have been described in chapter 2 (section 2.3.2). The same criteria were used at the pre- and post- stages, and the interrater reliability indicated a high degree of consensus. In reviewing the data, it is felt that there is adequate reliability to indicate trends in which one can have confidence.

A very positive outcome of this study was the family involvement. The interaction between researcher and the students' families (especially the mothers) can be considered an important factor in this study, not only by giving support to issues specifically related to it, but also by continually being accessible to share their feelings

and main concerns, as well as doubts about their child's development.

All three families commented on how valuable it was for them to be involved, how the study influenced the improvement and the quality of mother/child interaction, and how they were sorry when the study finished.

8.2. Conclusions and Further Research

Children with severe speech and physical impairments face many difficulties in developing emergent literacy skills. Little access to print related activities, few opportunities to interact during literacy activities at home or school, low expectations of their ability level and not being able to see literate people use print for real purposes, are all of them negative factors often mentioned in the literature.

The aims of this researh were to investigate and discuss communicative competence in very young children with SSPI, and to evaluate interventions intended to increase such children's communicative competence, encouraging their emergent literacy skills. It combines single case methodology (due to the diversity of the subjects) with some sort of group conclusions (due to some similarities between subjects, intervention strategies and goals). Its' results have implications for design and development of AAC communication systems and approaches towards intervention. The main conclusions are:

1 **Intervention programmes can indeed be implemented that lead to a substantial progress in children's participation in story time, with a consequent development of early literacy skills.**

2 **Assistive technology may indeed be vital for children with SSPI to be able to participate in literacy related events at their highest possible level of engagement. Graphic symbols used in an appropriately designed intervention programme may provide the first real opportunity for "independent reading".**

3 **The improvement of communicative skills in the classroom does not automatically transfer to the interaction in the home.**

This study demonstrated that the children's cognitive capabilities were masked by their SSPI, and how AAC technology may represent a liberating device for them. Another conclusion was that parents' perceptions of the child as a learner have significantly improved. Their interaction with the children was in fact an empowering process for them, even though the reluctance to resort to AAC techniques significantly limited the children's possibilities to participate. It seems therefore that more important than improving future AAC technology is promoting more functional use of existing technologies, and especially better training of parents and professionals in their appropriate applications.

Further research is therefore very much needed to investigate how to provide AAC devices which can be used effectively in the home environment. How can researchers and clinicians help parents to better improve the quality of their interaction with their children, as well as the experiences they provide them with? This is in agreement with Blackstone (1994), who states that research specifically addressing the family's involvement in AAC is lacking. As she further concludes, there is a need to increase our awareness, formulate major questions and develop theoretical perspectives in order to drive future research in the role of the family in AAC.

A multidisciplinary team approach to early intervention with children with SSPI can be instituted to facilitate more normal environmental experiences and increase their quality and quantity. The inclusion of parents in this program is all important, not only to ensure its application in the home, but to lessen the apprehension, frustration and confusion that are the normal reactions for parents attempting to bring up a child with SSPI. Further research is also needed on the implications for the whole school curriculum of these findings about AAC importance. As stated by Carpenter (1995), it was demonstrated beyond doubt that symbols afford curriculum access to students with special learning disabilities and by-pass textual difficulties usually presented by traditional orthography.

In summary, this thesis describes an educational intervention with three children with severe speech and physical impairments. The intervention focused on storybook reading experiences for early literacy development through the use of Augmentative and Alternative Communication technologies and methods. It was designed to address some of the issues considered important in the literature, and included strategies proposed for increasing the children's active participation during storybook reading sessions. Storybook reading sessions with the teacher at school and with the mothers or significant others at home were videotaped, and quantitative data collected by videotape analysis. Communicative acts of children and adults were classified into communication coding categories, and their meaning was discussed as to form, use and content.

One of the main conclusions of the study was that the use of stories promoting communication and language learning in storybook reading sessions can develop emergent literacy skills in children with SSPI. This is especially true if carried out in conjunction with AAC techniques, including graphic symbols and the technology to generate them. Another conclusion is that there is no automatic transfer of the improvement of communicative skills in the classroom to the interaction with the mothers. The methodologies used in this study were critically reviewed and directives for future research were provided.

To finalise, and giving continuity to Blackstone (1993) quotation used at the beginning of this chapter: *"Research in AAC can be a vehicle to many things. A danger, of course, is that research can become an end in itself, or a means to a different end like tenure, publications, funding, a successful business or job security. Whatever else, our research in AAC must be a vehicle to improving the lives of individuals with severe communication impairments. In the end, the measure of success for AAC research will be the degree to which it benefits AAC users in ways they not only recognise, but they value.*

What is the price of a life not lived?

....Researchers have to realise something, too. Although we augmented communicators are the raw material behind the numbers they crunch, we are also individuals with feelings, hopes and dreams. You should remember this as you putting us through the statistical package for the social sciences; and we should never forget that we are all in the same boat rowing towards the same shore. Whether we are a parent, consumer, speech-language pathologist, manufacturer or whoever, we may see things from a different perspective, but our ultimate objective should be the same:

To release a human spirit and let it soar.

Michael B. Williams (AAC User)

Let's hope that more Michaels will write their THOUGHTS ON THE FUTURE

Glossary

Battery Operated Toys - Children with severe physical disabilities also need to play using age-appropriate toys, as an important component in their development. Given their limited capacity to manipulate objects, such toys have to be adapted so that they can be controlled by these children using the same switch interfaces.

Buzzer - The buzzer is a very simple electronic device, which emits a sound when pressed. It can be used in different situations and for various functions such as getting people's attention, or initiating communication.

Communication Aids - Technical aids for communication are often categorized into "high" and "low" technology, in which the former refers to those communication aids using synthesised or digitised voice outputs. These titles can be misleading as some professionals might assume that "high-technology" aids are a more efficient way to transmit messages.

Communication Boards/Sets - Communication boards or sets are symbol-holding devices of different sizes and materials, in which selected symbols are located in a practical manner. Such boards can be either manual, electric (such as the dial scan) or electronic (for instance, speech digitisers or computers).

Communication Vest - It is a particularly useful symbol support, suggested by Goossens', Crain & Elder, 1992, that sometimes is also called a Bib Overlay. It is made of a Velcro sensitive material which symbols could readily stick to. Thus, it facilitated expressive communication by the non speaking child or aided language stimulation by the facilitator.

Dial Scan - A dial scan, otherwise known as an "electric board", is a type of symbol support system. It allows the user to choose symbols/items (or even objects) through a circular scan, using a pointer that turns at a pre-determined speed, which is controlled by the user by pressing his/her switch.

Direct Selection Techniques - Direct selection requires the user to point directly to the desired symbol either by using a functional part of his body (unaided selection) or by using some type of device (aided selection) such as a head pointer or a lighted pointer. With direct selection the individual is able to choose randomly any of the items in the selection set. She/he indicates the choice by directly touching it using the voice or a finger, hand, eye, or other body movement. At any one time, all of the elements of the selection set are equally available for selecting, they are not time dependent.

Encoded Systems - In this case every symbol or item in a communication board has a specific number, letter, or colour. The user selects the symbol or item by eye gazing at an Etran frame the corresponding number, letter, or colour. Morse code is an example of coded access, using the alphabet as its selection set in which a sequence of movements serves as an intermediate step toward signalling a letter in the alphabet.

Etran Frame - Or eye-pointing display is used for children requiring eye-pointing as a selection technique. It can be constructed using clear polycarbonate vinyl in a three-sided horseshoe shaped format. Symbols can be double-sided and placed in it, so that the communication partner can read the student's eye-point, and can also see symbols to permit quick modeling of communication.

Eye-gazing - Another form of direct, unaided selection sometimes also called "eye-pointing". The child communicates his/her choice by staring at a symbol placed in an Etran (transparent vinyl board). Eye-gazing is also sometimes used in the process of encoded selection described above.

Scanning Selection - It is the most common method used when direct selection is not physically possible.This indirect selection method, as the term suggests, involves intermediary steps. With this method, the selection set appears on a display and is sequentially scanned by a cursor or light. When the desired element is presented, the user emits a signal. In the case of an assistive device this signal is usually transmitted by a single switch (the control interface) or an array of two switches.The items to be

scanned can be presented in various formats (linear; circular, etc.) according to different needs and characteristics of the user. In a linear format, the items in the selection set are presented in a vertical or horizontal line and scanned one at a time or randomly. In a circular or rotary format the items are presented in a circle and scanned one at a time. Scanning selection can be either manual and electronic. In the case of manual scanning the partner points item by item until the user gives a pre-determined signal that the desired symbol/item is being indicated. Manual scanning is best used as an introduction to electronic scanning, as lasted use can leave the user overly dependent on his/her communicating partner, especially in regards to the initiation and maintenance of communication. A further disadvantage of this system is that it can become extremely slow.

Step-by-step and Automatic Scanning - Various techniques exist to increase the rate of scanning, such as automatic and step-by-step scanning. In the automatic mode, the communication equipment presents, at regulateable speeds, symbols or items to the user who then presses a switch when the desired symbol is highlighted. Step-by-step scanning, on the other hand, requires the user to press a switch repeatedly to move the cursor from one symbol or item to the next until the desired one is reached, where depending on the user's ability, s/he either waits for a while or activates another switch to select the chosen symbol/item.

Ke:nx™ Interface- Is a commercially available interface specially designed for physically handicapped people. Ke:nx™ Interface is a combination of hardware and software that permits users to attach an assortment of keyboard and mouse alternatives to the computer. The hardware interface allows for the connection of switches, alternate keyboards and other devices. For example, for users unable to use a keyboard, but obviously need access to all the computer's functions (keyboard, commands, mouse, etc.), Ke:nx can copy all those functions onto the computer screen and use a switch-controlled scanning process to choose the key or the function desired. In addition, concept keyboards such as the Key Largo™ can be linked to

Ke:nx, enabling the design of software functions to meet specific needs. The software deals with functions such as speech output, keyboard and mouse emulation, multi-tasking, custom displays, printing overlays, etc.

Macaw II™ (ZYGO)- It is a complex type of digitised speech device. Macaw II is comprised of a touch sensitive surface divided into between 2 and 32 choice selection areas, each of which corresponds to a digitised recording of several seconds length. As in the case of the Switch Mate™ (described below), either direct or indirect selection is possible. Features include multi-level, key-linked message retrieval, and the ability to copy, hide, and string messages.

Page Fluffers - Removable page fluffers (suggested by P.J. & McWilliam, 1993) are adapted to separate the pages of a book and permit easy turning with a whole hand or a headstick. They are made by attaching a paper clip to a piece of paper and subsequently gluing it to a piece of foam or sponge the same size. The thick foam provided a space between each page so children with less fine motor control could slip their fingers between the pages.

Speech Digitisers - All kinds of electronic equipment for recording and instantly emitting recorded speech (or any other sounds) exist at all levels of complexity and flexibility. The digital recording systems, as opposed to analogic recording systems (such as cassette recorders), permit almost instantaneous emission.

Switch Mate™ Digitiser (TASH) - It is a type of digitised speech device, that has four independent areas, each of which capable of taping several seconds of messages. Subsequently the recordings can be played either by direct selection (pressing one of the previously mentioned areas) or indirect selection (by pressing one of four external switches).

Symbol Selection Techniques - AAC Systems require not only a technical aid such as the physical support for graphic symbols, but also an efficient way of selecting

those symbols. The user's relative degree of muscular control is often the most important factor in deciding which symbol selection technique to use. The two basic categories include direct selection, and indirect selection.

References

Adams, M.R. (1966). 'Communication aids for the patient with amyotrophic lateral sclerosis', Journal of Speech and Hearing Disorders, 31, 274-275.

Alant, E. (1996). 'Augmentative and Alternative Communication in Developing Countries: Challenge of the Future', Augmentative and Alternative Communication, 12, 1-12.

Anderson, R., Wilson, P., and Fielding, L. (1988). 'Growth in Reading and how children spend their time outside of school', Reading Research Quarterly, 23, 285-303.

Anderson, R.C. and Pearson, P.D. (1984). 'A schema-theoretic view of basic processes in reading'. In P.D. Pearson (ed.), *Handbook of Reading Research*. New York: Longman.

Andrada, M.G., (1989). Risco Perinatal e Desenvolvimento da Linguagem na Criança. Doctoral Dissertation. APPC. Lisbon.

Azevedo, L. (1991). 'Technical aids and the transfer of technology to developing countries', Augmentative and Alternative Communication, 7(2), 143-146.

Azevedo, L., Féria, H., Nunes da Ponte, M.M., Wann, I. and Recellado, J., 1995. *Assistive Technology Training in Europe*. L. Azevedo (ed.) Heart Study Report.

Baker, B.D., McCoy, K., Stuart, S., and Nyberg, E.H. (1991). 'Vocabulary selection for intelligent parsing in an AAC system for aphasics'. In J.J. Presperin (ed.), *Proceedings of the 14th Annual Conference of RESNA* (112-114).

Barsch, R.H., and Rudell, B. (1962). 'A study of reading development among 77 children with cerebral palsy', Cerebral Palsy Review, 23 (2), 3-12.

Basil, C. (1992). "Social Interaction and Learned Helplessness in Severe Disabled Children', Augmentative and Alternative Communication, 8, 188-199.

Bates E. (1976). *Language and Context: The Acquisition of Pragmatics*. New York: Academic Press.

Bates, E., Camioni, L., & Volterra, V. (1975). "The acquisition of performatives prior to speech". Merill-Palmer Quarterly, 21 (3).

Batshaw, M.L. and Perret, Y.M. (1981). *Children with Handicaps: A Medical Primer*. Baltimore: Paul H. Brookes.

Bedrosian, J., Hoag, L., Calculator, S., and Molineaux, B. (1992). 'Variables influencing perceptions of communicative competence of an adult augmentative and alternative communication system',. Journal of Speech and Hearing Research, 35, 1105-1113.

Berninger, V. and Gans, B. (1986). 'Language profiles in nonspeaking individuals of normal intelligence with severe cerebral palsy', Augmentative and Alternative Communication, 2, 45-50.

Beukelman, D. (1992). 'AAC Research: A multi-dimensional learning community'. In D.J. Gardner-Bonneau (ed.). *Methodological Issues in Research in Augmentative and Alternative Communication*. Second ISAAC Research Symposium in Augmentative and Alternative Communication, 12-13 August, Philadelphia.

Beukelman, D. R. and Mirenda, P. (1992). *Augmentative and Alternative Communication: Management of Severe Communication Disorders in Children and Adults*. Baltimore: Paul Brookes.

Beukelman, D., and Yorkston, K. (1977). 'A communication system for the severely dysarthric speaker with an intact language system', Journal of Speech and Hearing Disorders, 42, 265-270.

Beukelman, D., McGinnis, J., and Morrow, D. (1991). 'Vocabulary selection in

augmentative and alternative communication.', Augmentative and Alternative Communication, 7(3) 171-185.

Beukelman, D., Yorkston, K., and Dowden, P. (1985). *Communication Augmentation: A Casebook of Clinical Management.* San Diego, CA: College Hill Press.

Bishop, K., Rankin , J. and Mirenda, P. (1994). 'Impact of graphic symbol use on reading acquisition', Augmentative and Alternative Communication, 10 (2) 113-125.

Bjorck-Ackesson, E., Jonker, V., Heim, M. and Mills, A. (1994). 'Promoting communication development in young AAC users: facilitating interaction strategies for adult partners.' Instructional course 6th Biennial ISAAC Conference, Maastricht, The Netherlands.

Bjorck-Akesson, E. (1993). *Communicative Interaction between Young Nonspeaking Children with Physical Disabilities and Their Parents.* Handicap Research Group. Report Nº 13.

Blackstone, S. (1990a). 'Populations and practices in AAC'. Augmentative Communication News. 3 (4) 1-3.

Blackstone, S. (1989) 'The 3 r's reading, writing, and reasoning', Augmentative Communication News., 2, (1). 1-3.

Blackstone, S. (1993) 'We must play the cards we are dealt', Augmentative Communication News, 6 (5) 1-3.

Blackstone, S. and Pressman, H. (1995). 'Outcomes in AAC', in C. Krezman (ed.), *Conference Report. Alliance 95.* Augmentative Communication Inc. Monterey, CA.

Blackstone, S. and Williams M. (1994). 'Family involvement in the AAC intervention process: Conceptual and methodological issues'. In: J. Brodin and E. Bjorck-Akesson (eds.) *Methodological Issues in Research in Augmentative and Alternative Communication*. Third ISAAC Research Symposium in Augmentative and Alternative Communication, 14-15, October ,The Netherlands.

Blackstone, S.W., Carter, G., Berg, M. H., and Biondi, J. (1992). 'Quality in the schools: An AAC consumer satisfaction questionnaire'. Augmentative and Alternative Communication, 8(2), 116.

Bliss, C. (1965). *Semantography-Blissymbolics*. Sydney, Australia: Semantography Publications.

Bliss, C. and McNaughton, S., (1975). *The Book to the Film: "Mr. Symbol Man."* Sydney, Australia: Semantography Publications.

Bloom, D. and Green, J. (1984). 'Directions in the sociolinguistic study of reading'. In P. D. Pearson (ed.), *Handbook of Reading Research* . New Longman, York.

Bloom, L. & Lahey, M. (1978). *Language development and language disorders*. New York: Willey.

Bloom, L. (1970). *Language Development: Form and Function in Emerging Grammars*. Cambridge, MA: MIT Press.

Bloomberg, K., and Johnson, H. (1990). 'A statewide demographic survey of people with severe communication impairments', Augmentative and Alternative Communication. 6(1) 50-60.

Bloomberg, K., Karlan, G., and Lloyd, L. (1990). 'The comparative translucency of initial lexical items represented by five graphic symbol systems and sets', Journal of Speech and Hearing Research, 33, 717-725.

Bottorf, L. and Depape, D. (1982). 'Initiating communication systems for severely speech-impaired persons', Topics in Language Disorders. 2, 55-71.

Bradley, R., Rock, S., Caldwell, B., & Brisby, J. (1989). "Uses of the HOME inventory for families with handicapped children". American Journal of Mental Retardation, 94, 313-330.

Brodin, J. (1991). *To Interpret Children's Signals: Play and Communication in Profoundly Mentally Retarded and Multiply Handicapped Children.* Unpublished doctoral dissertation, University of Stockholm.

Brodin, J. (1992). 'Qualitative research and ethical aspects in AAC'. In: D.J. Gardner-Bonneau (ed.), *Methodological Issues in Research in Augmentative and Alternative Communication.* Second ISAAC Research Symposium in Augmentative and Alternative Communication, 12-13 August, Philadelphia.

Brodin, J., and Bjork-Akesson, E. (eds.).(1990). *Methodological Issues in Research in Augmentative and Alternative Communication Proceedings of the First ISAAC Research Symposium in Augmentative and Alternative Communication.* Toronto: ISAAC.

Brown, C.(1954). *My left foot.* London: Secker and Warburg.

Bruner, J. (1977). 'Early social interaction and language acquisition'. In H.R. Schaffer (ed.), *Studies in Mother-Infant Interaction* . New York: Academic Press.

Bruner, J. (1983). Child's Talk. Oxford: Oxford University Press.

Bruno, J., and Sauer M. (1992). 'AAC services: Impact to the service delivery model', Augmentative and Alternative Communication, 8(2) ,120.

Buckley, S. (1985). 'Attaining basic educational skills: Reading, writing and number'. In D. Lane and B. Stratford (eds) *Current Approaches to Down's Syndrome.*

London: Holt, Rinehart and Winston.

Buckley, S. (1994). 'Early Intervention: the state of the art.' in Barry Carpenter (ed.) Early Intervention: Where are we now. (pp. 13-25) Westminster College. Oxford.

Burkhart, L.J. (1987). *Using computers and speech synthesis to facilitate communicative interaction with young and/or severely handicapped children.* College Park, MD: Burkhart.

Burkhart, L.J. (1993). *Total Augmentative Communication in the Early Childhood Classroom.* Linda J. Burkhart, 6201 Candle Court, Elderburg, MD 21784.

Burroughs, J. A. (1986). *A Comparative Study of the Ease of Learning of the Two Symbol Systems by Language Delayed Dhildren.* Master's thesis, University of Arkansas, Little Rock.

Buzolich, M.J., and Wiemann, J.M. (1988). 'Turn taking in atypical conversations: The case of the speaker/ augmented-communicator dyad". *Journal of Speech and Hearing Research* 31, 3-18.

Calculator, S. and Dollaghan, C. (1982). 'The use of communication boards in a residential setting: An evaluation', Journal of Speech and Hearing Disorders, 47, 281-287.

Calculator, S.N., and Jorgensen, C. (1991). 'Integrating AAC instruction into regular education settings: Expounding on best practices', Augmentative and Alternative Communication, 7 (3), 204-214.

Cambourne, B., (1988). *The whole story: Natural learning and the acquisition of literacy in the classroom.* New Zealand: Ashton Scholastic Limited.

Carpenter, B. (1987a). *A Formative Evaluation of a Makaton-Based Reading Programme.* University of Nottingham.

Carpenter, B. (1987b). *Logographic Communication Systems as an Aid to the Acquisition of Reading Skills*. Surrey: M.V.D.P.

Carpenter, B., (1985). *Developing Reading Skills Using Makaton Symbols*. Camberley: Makaton Vocabulary Development Project.

Carpenter, B., (1990) Unlocking the Door: Access to English in the National Curriculum for Children with Severe Learning Difficulties. Interactive Approaches to Teaching the Core Subjects, Beryl Smith ed.

Carpenter, B., (1994). 'Shared learning: the developing practice of integration for children with severe learning difficulties', European Journal of Special Needs Education, 9 (2), 182-189.

Carpenter, B., (1995). 'Affording Access: A discussion of the logographic function of symbols, and their place in the curriculum for students with severe learning disabilities'. Paper presented at ECART, 1995 Conference. October, Lisbon, Portugal.

Carpenter, B., (1995). 'Tell me about Katie: Attitudes of mainstream 7-8 year olds to a peer with down's syndrome', The University of Portsmouth. Down's Syndrome: Research and Practice3 (2) 45-52.

Carpenter, B., and Detheridge, T., (1994). 'Writing With Symbols', Support for Learning, 9 (1).

Carrier, J. K. (1974). 'Application of functional analysis to a non-speech response mode to teaching language'. In L. V. McReynolds (ed.), *Developing systematic procedures for training children's language*. Rockville, MD: ASHA Monograph Nº18a.

Cazden, C. B., (1983). 'Adult assistance to language development: Scaffolds, models, and direct instruction'. In R. P. Parker and F. A. Davis (eds.), *Developing*

Literacy: Young Children's Use of Language . Newark, DE: International Reading Association.

Center, Y., and Ward, J. (1984). 'Integration of mildly handicapped cerebral palsied children into regular schools', Exceptional Child, 31, 104-113.

Chapman, R. and Miller, J. (1980). 'Analyzing language and communication in the child'. In R. Schiefeldbusch (ed.), *Nonspeech Language and Communication: Analysis and Intervention* Austin, TX: Pro-ED.

Chen, L. Y. (1968). '"Talking hand" for aphasic patients',. Geriatrics, 23, 145-148.

Chomsky, C. (1981). 'Write now, read later'. In C.B. Cazden (ed.), *Language in Early Childhood Education*. Washington, DC: National Association for the Education of Young Children.

Clay, M. (1975). *What did I write*? Portsmouth, NH: Heinmann.

Clay, M.M. (1979). *Reading: The Patterning of Complex Behaviour*. London: Heinemann.

Clemente, R. A.(1995).*Desarrollo del Lenguaje*. Barcelona: Octaedro.

Cochran-Smith, M. (1984). *The Making of a Reader*. Norwood, NJ: Ablex. Publishing Co.

Cohen, L. & Manion, L., (1989). *Research Methods in Education*, London, Routledge.

Coleman, P.P., (1991) *Literacy Lost: A Qualitative Analysis of Literacy Experiences and Young Children with Severe Speech and Physical Impairments*. Unpublished doctoral dissertation, University of North Carolina at Chapel Hill

Coleman, P.P., and Steelman, J. D. (1992). 'Emergent literacy and AAC users:

Research and practice. Augmentative and Alternative Communication, 8(2), 124.

Coleman, P.P., Koppenhaver, D.A., and Yoder, D.E. (1991). *Emerging Literacy Activities for Preschool Augmentative Communicators.* Unpublished manuscript.

Cook, A.M., and Hussey, S.M., (1995). *Assistive Technologies: Principles and Practice.* Mosby-Year Book, Inc. St. Louis, Missouri.

Cornforth, A.R., Johnston, K., and Walker, M. (1974). 'Makaton vocabulary: Teaching sign language to the deaf mentally handicapped. Apex, 2, 23-24.

Creech, R., (1984). 'The key that releases the soul of a man'. In *Conversations with Non-Speaking People.* Toronto, Ontario: Canadian Rehabilitation Council for the Disabled.

Creek, R, (1988). 'Paravocal communicators speak out', North Carolina Augmentative Communication Newsletter, 6 (3), 12.

Cregan, A. (1982). *Sigsymbols.* Cambridge, UK: Learning Development Aids.

Cregan, A., and Lloyd L. (1988). *Sigsymbol dictionary: American edition.* Wauconda, IL: Don Johnston Developmental Equipment.

Crystal, D. (1980). Introduction to Language Pathology. Arnold, London.

Crystal, D. (1986). 'ISAAC in chains: The future of communication systems', Augmentative and Alternative Communication, 2(4), 140-145.

Culp, P. (1982). 'Communication interactions: nonspeaking children using augmentative systems and their mothers'. Paper presented at the American Speech Language Hearing Convention, Toronto.

Cutting, B. (1989). *Getting Started in Whole Language.* San Diego: Wright Group. Hong Kong: Applecross Ltd. U.S.A.

Cutting, B. & Milligan, J. (1991). "Learning to read in New Zealand", In C. Kamii, M. Manning, & G. Manning (Eds.), *Early Literacy: A constructivist foudation for whole language.* West Haven, CT: National Education Association Professional Library.

Damásio, A.R., and Damásio, H., (1992). 'Brain and language', Scientific American. 267 (3) 63-71

Danilova L.A. (1983). 'Methods of improving the cognitive and verbal development of children with cerebral palsy' (R. H. Silverman, Trans., Monograph Nº 23). New York: World Rehabilitative Fund.

Deich, R.F., and Hodges, P.M. (1977). *Language without Speech.* NY: Bronner/Mazel.

Detheridge, T. (1996 B). *Developing information technology competencies. in Learning Through Interaction: Technology and Children with Multiple Disabilities.* N. Bozic and H. Murdoch (eds.). David Fulton Publishers, London.

Detheridge, T., & Detheridge, M., (1997). *Literacy Through Symbols*, David Fulton Publishers, London.

Dixon, C.C., and Curry, B. (1973). 'Some thoughts on the communication board', Journal of Speech and Hearing Disorders, 38, 73-88.

Donaldson, M.L., (1995). *Children with Language Impairments: An Introduction.* Jessica Kingsley Publishers London and Bristol, Pennsylvania.

Eagleson, H., Vaughn, G., and Knudson, A. (1970). 'Hand signals for dysphasia', Archives of Physical Medicine and Rehabilitation, 51, 111-113.

Edelman G.M. (1987). *Neural Darwinism: The Theory of Neuronal Group Selection.* New York. Basic Books.

Ehri., L.C. (1987). 'Learning to read and spell words', Journal of Reading Behaviour, 19, 5-31.

Eisle, B. (1991). Managing the whole language classroom. Cypress, CA: Creative Teaching Press, Inc.

Elder, P., and Bergman, J. (1978). 'Visual symbol communication instruction with non-verbal, multiply handicapped individuals', Mental Retardation, 16, 107-112.

Enderby, P. and Phillip, R. (1986). 'Speech and language handicap: Towards knowing the size of the problem. British Journal of Disorders of Communication, 21, 151-65.

Erickson, K., Koppenhaver, D.A. and Yoder, D. (1994). 'Adult literacy and AAC users: Research findings and future directions.'. ISAAC'94 Conference Book and Proceedings.

Ferreiro, E. (1986). 'The interplay between information, and assimilation in beginning literacy'. In W. H. Teale and E. Sulzby (eds.), *Emergent Literacy* . Norwood, NJ: Ablex Publishing Co.

Ferreiro, E. and Teberosky, A. (1983). *Literacy Before Schooling*. London: Heinemann Educational Books.

Ferreiro, E., & Teberosky, A. (1979/82). *Literacy before schooling*. Portsmouth, NH: Heinemann.

Foley, B.F. (1989). *Phonological Recoding and Congenital Dysarthria*. Unpublished doctoral dissertation, the Graduate School of the University of Massachusetts.

Forbus, S.S. (1987). *A Comparative Study of the Ease of the Learning of Rebus and Bliss Symbols by Severely Mentally Retarded Adults*. Master's thesis, University of Arkansas, Little Rock.

Fristoe, M., and Lloyd, L. (1979). 'Nonspeech communication'. In N.R. Ellis (ed.), *Handbook of Mental Deficiency: Psychological Theory and Research* (2nd ed.) New York: Lawrence Erlbaum Associates.

Fuller, D.R., Lloyd, L.L., and Schlosser, R.W. (1992). 'Further development of an augmentative and alternative communication symbol taxonomy,' Augmentative and Alternative Communication, 8 (1), 67-74.

Galda, L., Cullinan, B., & Strickland, D. (1993). *Language, literacy, and the child.* Forth Worth, TX: Harcourt Brace Jovanovich College Publishers.

Gardner, J. (1968). *No Easy Victories.* New York: Harper and Row.

Gardner, R.A., and Gardner, B.T. (1979). 'Teaching sign language to a chimpanzee'. In R.L. Schiefelbusch and J.H. Hollis (eds.), *Language Intervention from Ape to Child.* Baltimore: University Park Press. (Reprinted from *Science,* 1969, 165, 664-672.)

Gazzaniga, M. (1974). 'Cerebral dominance viewed as a decision system'. In (ed. Dimond and Beaumont Hemispheric Function in the Human Brain) Eleck Science.

Gerber, S. and Kraat, A., (1992). 'Use of a developmental model of language acquisition: Applications to children using AAC systems', Augmentative and Alternative Communication, 8 (2), 19-32.

Gersten, R. and Dimino, J. (1993). 'Visions and revisions: A special education perspective on the whole language controversy', Remedial and Special Education, 14 (4), 5-13.

Gertenrich, R. (1966). 'A simple mouth-held writing device for use with cerebral palsy patients', Mental Retardation, 4, 13-14.

Glennen, S.L. (1991). 'The effect of communication aid characteristics on the

interaction skills of nonspeaking persons and their adult speaking partners'. In J.J. Presperin (ed.), *Proceedings of the 14th Annual Conference of RESNA*. Washington, DC: RESNA Press.

Goddard, C. (1977). 'Application of symbols with deaf children', Blissymbolics Communication Institute Newsletter, No. 3. Toronto, Ontario: Blissymbolics Communication Institute.

Goldberg, H.R., and Fenton, J. (1960). *Aphonic Communication for Those with Cerebral Palsy: Guide for the Development and Use of a Communication board.* New York: United Cerebral Palsy of New York State.

Goodenough-Trepagnier, C., Tarry, E., and Prather, P. (1982). 'Derivation of an efficient nonvocal communication system', Human Factors, 24, 163-172.

Goodman, K., (1986). *What's whole in whole language*? Portsmouth, NH: Heinemann.

Goodman, L. (1976). 'Reading: A Psycholinguistic Guessing Game'. In H. Singer and R.B. Ruddell (eds) *Theoretical Models and Processes of Reading* (second edition). Newark, Delaware: International Reading Association.

Goodman, Y. (1980). 'The Development of Initial Literacy'. In H. Goelman, A. Oberg, and F. Smith (eds.), *Awakening to Literacy* . London: Heinemann Educational Books.

Goossens', C. A. (1989). 'Aided Communication intervention before assessment: A case study of a child with cerebral palsy', Augmentative and Alternative Communication, 5 (1), 14-26.

Goossens', C.A. (1983). *The Relative Iconicity and Learnability of Verb Referents Differentially Represented by Manual Signs, Blissymbols, and Rebus symbols: An Investigation with Moderately Retarded Individuals*. Doctoral dissertation, Purdue

University.

Goossens',C., Crain, S. and Elder, P. (1992). *Engineering the Preschool Environment for Interactive, Symbolic Communication: 18 months to 5 years developmentally*. S.E. AC Conference Publications 2430 11th Avenue North, Birmingham, AL 35234.

Granlund, M. (1993). *Communicative Competence in Persons with Profound Mental Retardation- Intervention Focused on the Social Context.* Acta Universitatis Upsaliensis. Stockholm, Almqvist and Wiksell.

Granlund, M. (1996). Measuring the outcome of AAC Intervention. The Fourth ISAAC Symposium on Research in Augmentative and Alternative Communication. Vancouver, Canada.

Greer, J.V. (1991). 'The tyranny of words', Exceptional Children, 57, 486-487.

Grove, N., and Walker, M. (1990). 'The Makaton Vocabulary: Using manual signs and graphic symbols to develop interpersonal communication', Augmentative and Alternative Communication, 6 (1), 15-28.

Hackney, A.C. (1981). *Problems of Language and Communication in Severely Educationally Retarded Children*. Unpublished D.Phil. thesis: University of Oxford.

Hall, N. (1987). *The emergence of literacy*. Portsmouth, NH: Heinemann.

Harris, D. (1978). *Descriptive Analysis of Communicative Interaction Processes Involving Non.Vocal Severely Physically Handicapped Children.* Unpublished doctoral dissertation, University of Wisconsin, Madison.

Harris, D. (1982). 'Communication interaction processes involving nonvocal physically handicapped children', Topics in Language Disorders. 2 (2), 21-37.

Harris, D. and Vanderheiden, G. (1980). 'Enhancing the development of communicative interaction'. In R. Schiefelbush (ed.), *Nonspeech Language and Communication: Analysis and Intervention.* Austin, TX: Pro-Ed.

Harris-Vanderheiden, D. (1976). 'Blissymbols and the mentally retarded'. In G. Vanderheiden and K. Grilley (eds.), *Non-Vocal Communication Techniques and Aids for the Severely Physically Handicapped.* Austin, TX: Pro-Ed.

Heim, M. (1990). 'Communicative skills of nonspeaking CP- children: A study of interaction.' Paper to the 4th Biennial ISAAC Conference. Stockholm, Sweden.

Heim, M. J. M. (1989). *Communicative Skills of Children with Cerebral Palsy and Little or No Functional Speech.* Institute for General Linguistics, University of Amsterdam.

Hjelmquist, E. (1990). 'Methodological approaches to AAC and other "technologies" of communication from a developmental perspective'. First ISAAC Research Symposium in AAC. August 16-17th. Stockholm.

Hoffman, M. (1990). *The World Almanac and Book of Facts.* New York: Pharos Books.

Hoolihan, C. (1984). 'Too little, too soon: The literature of deaf education in 17th century Britain (Part 1)', Votta Review, 86, 347-353.

Hoolihan, C. (1985). 'Too little, too soon: The literature of deaf education in 17th century Britain (Part 2)', Votta Review, 87, 28-44.

Hurlbut, B., Iwata, B., and Green, J. (1982). 'Nonvocal language acquisition in adolescents with severe physical disabilities: Blissymbol versus iconic stimulus formats', Journal of Applied Behavior Analysis, 15, 241-258.

Iacono, T. (1992 b). 'A step back from small 'n' designs to view the total picture'.

In: D. J. Gardner-Bonneau (Ed.). *Methodological Issues in Research in Augmentative and Alternative Communication.* Proceedings of the Second ISAAC Research Symposium in Augmentative and Alternative Communication, 12-13 August, Philadelphia.

Iacono, T. (1992c). 'AAC for writing and conversational participation in an academeic setting'. Paper to the Fifth Isaac 1992 Biennial Conference, Philadelphia, USA.

Iacono, T.A. (1992 a). 'Individual language learning style and AAC', Augmentative and Alternative Communication, 8(1), 33-40.

Inhelder, B. and Piaget, J. (1964). *The Early Growth of Logical Thinking from Childhood to Adolescence.* New-York: Basic Books.

Jackson, M. (1993). *Literacy.* Mary Jane Drummond and Andrew Pollard (ed.). David Fulton Publishers. London.

Johnson, R.M. (1995). *The Picture Communication Symbols Guide.* Solana Beach, CA: Mayer Johnson Company.

Jorgensen, D. L. (1989). *Participant observation: A methodology for human studies.* Newbury Park, CA: Sage Publications.

Juel, C. (1988). 'Learning to read and write'. Journal of Educational Psychology, 80, 437-477.

Juel, C. (1991). 'Beginning reading'. In R. Barr, M. L. Kamil, P. Mosenthal, and P. D. Pearson (eds.), *Handbook of Reading Research* (vol. 2) New York: Longman.

Kangas, K.A. (1991). *Relationship of Communication Speed Rate to the Perceived Competence of High School AAC Users.*Unpublished doctoral dissertation, Purdue University, West Lafayette, IN.

Kates, B., and McNaughton, S. (1975). *The First Application of Blissymbolics as a*

Communication Medium for Nonspeaking Children: History and Development, 1971-1974. Toronto, Ontario: Blissymbolics Communication Institute.

Kavanaugh, R.N., Holmlund, B.A., and Krause, A.E. (1966). 'Communications systems for the physically handicapped', *Digest of the Canadian Medical and Biological Engineering Conference.*

Kazdin, A. (1982). *Single-case Research Designs: Methods for clinical and Applied Settings*, Oxford, Oxford University Press.

Kelford Smith, A., Thurston, S., Light, J., Parnes, P., and O'Keefe, B. (1989). 'The form and use of written communication produced by physically disabled individuals using microcomputer', Augmentative and Alternative Communication, 5 (2), 115-124.

Kiernan, C., (1985). "Single-Subject Designs", in Hegarty, S. & Evans, P., (Eds.) Research and Evaluation Methods in Special Education, Windsor, NFER-Nelson, pp.32-50.

Kiernan, C., Reid, B. & Goldbart, J., (1987) Foundations of Communication and Language: Course Manual, Manchester, Manchester University Press in association with The British Institute of Mental Handicap.

Kiernan, C., Reid, B., and Jones, L. (1982). *Signs and Symbols: A Review of Literature and Survey of the Use of Non-Vocal Communication.* London: Heinemann Educational Books.

Killilea, M. (1983). *Karen.* New York: Dell.

King-DeBaun, P. (1990) *Storytime: Stories, Symbols and Emergent Literacy Activities for Young Special Needs Children.* Acworth, GA: Creative Communicating.

King-DeBaun, P. (1992). Using Stories to promote beginning communication, language and creativity in young children with disabilities. Preconference paper and workshop presented at Closing the Gap, Minnesota, USA.

King-DeBaun, P. (1993a). *Storytime, Just for Fun!* Park City, UT: Creative Communicating. Knapp, M. (1980). *Essentials of Nonverbal Communication.* New York: Holt, Rinehart and Winston.

King-DeBaun, P. (1993b). Beginning language, communication and creativity for children with disabilities. Creative Communicating. Park City, UT.

King-DeBaun, P. (1994). 'Creative technology: Solutions for emergent literacy and interactive communication. Workshop given at the Technical University of Lisbon, Portugal.

King-DeBaun, P. (1995). 'We' ve Done That and Been There! - Beyond Repetitive Lines'. Paper presented at Closing the Gap Conference, Minneapolis, USA.

King-DeBaun, P. (1995). Babes in Bookland. Closing the Gap, 14, nº 4.

Knapp, M. (1980). 'Essentials of nonverbal communication'. Holt, Rinehart & Winston (ed.) New York.

Koke, S. and Neilson, J. (1987). *The Effect of Auditory Feedback on the Spelling of Nonspeaking Physically Disabled Individuals*. Unpublished master's thesis. University of Toronto, Toronto, Canada.

Koppenhaver, D.A. (1991). A descriptive analysis of classroom literacy instruction provided to children with severe speech and physical impairments. Unpublished doctoral dissertation. University of North Carolina at Chapel Hill.

Koppenhaver, D.A. (1992). 'Early written language learning and instruction of AAC users'. Paper presented at the National Institute on Disability and Rehabilitation

Research Consensus Validation Conference on Augmentative and Alternative Communication, Arlington, Virginia.

Koppenhaver, D.A. and Pierce, P.P. (1992). 'Literacy and AAC: Communicating Every Which Way We Can'. Proceedings of the 14th Annual Southeast Augmentative Communication Conference. Birmingham, AL: United Cerebral Palsy of Greater Birmingham, Inc.

Koppenhaver, D.A. and Yoder, D.E. (1990a). 'A descriptive analysis of classroom reading and writing instruction for adolescents with severe speech and physical impairments'. Paper presented at the meeting of the International Special Education Congress, Cardiff, Wales.

Koppenhaver, D.A. and Yoder, D.E. (1990b). 'Classroom interaction, literacy acquisition, and nonspeaking children with physical impairments'. Paper presented at the biennial meeting of the ISAAC, Stockholm, Sweden.

Koppenhaver, D.A. and Yoder, D.E. (1988). 'Literacy and the AAC user'. ISAAC Conference: Anaheim.

Koppenhaver, D.A. and Yoder, D.E. (1989). 'Study of a spelling strategy for physically disabled augmentative communication users', Communication Outlook, 10 (3), 10-12

Koppenhaver, D.A. and Yoder, D.E. (1992) 'Literacy issues in persons with severe physical disabilities' In R. Gaylord-Ross (ed), *Issues and Research in Special Education.* (Vol.2) New York: Columbia University, Teachers College Press.

Koppenhaver, D.A. and Yoder, D.E. (1993). 'Classroom literacy instruction for children with severe speech and physical impairments (SSPI): What is and what might be', Topics in Language Disorders, 13 (2), 1-15.

Koppenhaver, D.A., Coleman, P.P., Steelman, J.D. and Yoder, D.E. (1991). 'The

implications of emergent literacy research for children with development disabilities. American Journal of Speech Language Pathology: A Journal of Clinical Practice, 1 (1), 38-44.

Koppenhaver, D.A., Coleman, P.P., Steelman, J.D. and Yoder, D.E. (1992). 'The emergence of literacy research in AAC: Methodological issues and research priorities'. Second ISSAC Research Symposium in Augmentative and Alternative Communication, Philadelphia, Pennsylvania.

Koppenhaver, D.A., Coleman, P.P., Steelman, J.D. and Yoder, D.E. (1994). 'Enhancing literacy learning in children and adults'. In: D.E. Pressman and C. Watkins (eds.), *Handbook of Augmentative Communication.* Andover Medical Publishers.

Koppenhaver, D.A., Evans, D.A. and Yoder, D.E. (1991). 'Childhood reading and writing experiences of literate adults with severe speech and motor impairments', Augmentative and Alternative Communication, 7(1), 20-33.

Kopppenhaver, D.A., Pierce, P., Steelman, J., Staples, A., Erickson, K., and Yoder, D.E. (1994). 'The literacy literature revised: What have we learned since 1990" ISAAC' 94 Conference Book and Proceedings.

Kopppenhaver, D.A., Pierce, P.L., Steelman, J.D. and Yoder, D.E. (1993). 'Contexts of Early Literacy Intervention for children with Developmental Disabilities'. In: M. Fey et al. (eds.), *Language Intervention in the Early School Years.* Baltimore: Paul Brookes.

Kopppenhaver, D.A., Steelman, J., Pierce, P., Yoder, D., and Staples, A. (1993). 'Developing Augmentative and Alternative Communication Technology in Order to Develop Literacy" Technology and Disability. Andover Medical

Kraat, A. (1985). *Communication Interaction between Aided and Natural Speakers: A*

state of the art Report. Toronto: Canadian Rehabilitation Council for the Disabled.

Lariviere, J.A. (1996). 'Integrating technology into literacy programs for improved access and participation'. Paper presented at ISAAC Conference, Vancouver, Canada.

LeCompte, M. D. & Goetz, J. P. (1982). "Problems of Reliability and Validity in Ethnographic Research". Review of Educational Research, 52.

Lenneberg, E.H. (1967). *Biological Foundations of Language*. New York: John Wiley and Sons.

Lenneberg, E.H. (1969). 'On explaining language'. Science, 164: 635-43

Leonhart, W.,and Maharaj, S. (1979). *A Comparison of Initial Recognition and Rate of Acquisition of Pictogram Ideogram Communication (PIC) and Bliss Symbols with Institutionalized Severely Retarded Adults*. Unpublished manuscript.

Letto, M., Bedrosian, J.L. and Skarakis-Doyle, E. (1994). 'Application of Vygotskian developmental theory to language acquisition in a young child with cerebral palsy', Augmentative and Alternative Communication, 10 (3), 151-160

Light, J. (1985). *The Communicative Interaction Patterns of Young Nonspeaking Physically Disabled Children and Their Primary Caregivers*. Unpublished master's thesis, University of Toronto, Toronto, Ontario, Canada.

Light, J. (1988). 'Interaction involving individuals using augmentative and alternative communication systems: State of the art and future directions', Augmentative and Alternative Communication Journal. 4 (2), 66-82

Light, J. (1989). Toward a definition of communicative competence for individuals using augmentative and alternative communication systems. Augmentative and Alternative Communication, 5 (2) 137-145

Light, J. (1996). Getting started: Practical Research Skills for Clinicians. ISAAC Instructional Course. Vancouver, Canada.

Light, J., and Binger, C. (1992). 'Story reading experiences of preschoolers using AAC systems'. Augmentative and Alternative Communication, 8 (2), 148.

Light, J., and Kelford-Smith, A., (1993) 'Home Literacy Experiences of Preschoolers Who Use AAC Systems and Their Nondisabled Peers', Augmentative and Alternative Communication, 9 (1), 10-22.

Light, J., and McNaughton, D. (1993) 'Literacy and Augmentative communication and alternative communication (AAC): The expectations and priorities of parents and teachers', Topics in Language Disorders, 13 (2), 33-46.

Light, J., Binger, C. and Kelford-Smith, A., (1994). 'Story Reading Interactions between Preschoolers Who Use AAC and Their Mothers', Augmentative and Alternative Communication, 10 (4), 255-268.

Light, J., Collier, B., and Parnes, P. (1985a). 'Communicative interaction between young nonspeaking physically disabled children and their primary caregivers: Part I-Discourse patterns', Augmentative and Alternative Communication, 1(2), 74-83.

Light, J., Collier, B., and Parnes, P. (1985b). 'Communicative interaction between young nonspeaking physically disabled children and their primary caregivers: Part II-communicative functions', Augmentative and Alternative Communication, 1(2), 98-107.

Light, J., Datillo, J., English, J., Guitierrez, L., and Hartz, J. (1992). 'Instructing facilitators to support the communication of people who use augmentative communication systems', Journal of Speech and Hearing Research, 35, 865-875.

Light, J., Kelford-Smith, A., and McNaughton, D. (1990). 'The literacy experiences of preschoolers who use augmentative and alternative communication systems'.

Paper presented at the meeting of the International Society for Augmentative and Alternative Communication, Stockolm, Sweden.

Light, J., Lindsay, P., Siegel, L., and Parnes, P. (1990). 'The effects of message and coding techniques on recall by literate adults using AAC systems', Augmentative and Alternative Communication, 6 (3), 184-201.

Lindsay, P., Cabria, R., Mc-Naughton, S., and Warrick, A. (1986). 'The educational needs of nonspeaking students and their teachers'. Paper presented at the Fourth Biennial Conference of the International Society for Augmentative and Alternative Communication, Cardiff, Wales.

Lloyd, L. and Blishchak, D.M. (1992). 'AAC Terminology Policy and Issues Update', Augmentative and Alternative Communication, 8 (2), 50-60.

Lloyd, L. and Kangas, K.A., (1988). 'Think ink: Perspectives on why, when, where, and how to publish', The proceedings of the 3rd Annual Minspeak Conference. Wooster, OH: Prentke Romich

Lloyd, L.L., and Fuller, D.R. (1986). 'Toward an augmentative and alternative communication symbol taxonomy: A proposed superordinate classification', Augmentative and Alternative Communication, 2 (4), 165-171.

Lloyd, L.L., Quist, R.W., and Windsor, J. (1990). 'A proposed augmentative and alternative communication model', Augmentative and Alternative Communication, 6(3), 172-183.

Lock, A. (1980). *The Guided Reinvention of Language*. London: Academic Press.

Lorenz, S., Sloper, T., & Cunningham, C. (1985). Reading and Down syndrome. British Journal of Special Education, 12, 65-67.

Lorrett, L. (1969). 'A method of communication for non-speaking severely subnormal

children', British Journal of Disorders of Communication, 4, 64-66.

Lundberg, I. (1984). "Learning to read', School Research Newsletter, August. Sweden: National Board of Education.

Luria, A. R. (1977). *Cognitive development: Its cultural and social foundations.* Cambridge, MA: Harvard University Press

Maehr, J. (1991). *Language and literacy.* Ypsilanti, MI: The High / Scope Press.

Maling, R.G., and Clarkson, D.C. (1963). 'Electronic controls for the tetraplegic (POSSUM)', Paraplegia, 1, 162-174.

Marvin, C., & Mirenda, P. (1993) "Home Literacy Experiences of preschoolers enrolled in Head Start and special education programms". Journal of early intervention, 17, 351-367.

Mayberry, R. (1976). 'If a chimp can learn sign language, surely my nonverbal client can, too', Asha, 18, 223-228.

Mc Lane, J. and McNamee, G. (1991). 'The beginnings of literacy. Zero to Three. 12 (1), 1-8.

McDonald, E. and Schultz, A. (1973). 'Communication boards for cerebral palsied children', Journal of Speech and Hearing Disorders, 38, 73-88

McEwen, I. and Karlan, G. (1990). 'Case studies: Why and How', Augmentative and Alternative Communication, 6 (1), 69-75.

McEwen, I. and Lloyd, L. (1990). 'Some considerations about the motor requirements of manual signs', Augmentative and Alter-native Communication, 6(3), 207-216.

McGregor G., Arango, G., Fraser, B., and Kangas, K. (1992). PCA checklist: The

Physical Caracteristics Assessment: Computer Access for individuals with cerebral Palsy. DonJohnston inc., Wauconda, USA.

McLean, J.E., & Snyder-McLean, L. (1988). Application of pragmatics to severely mentally retarded children and youth. In R. L. Schiefelbusch & L.L. Llyod (Eds), *Language perspectives: Acquisition, retardation, and intervention.* Austin, TX: PRO-ED.

McLean, M., Smith, B., McCormick, K., Schakel, J. and McEvoy, M. (1991). *Developmental Delay: Establishing Parameters for a Preschool Category of Exceptionality* (Position Paper). Reston, VA: Council for Exceptional Children, Division for Early Childhood.

McNaughton, S. (1976). 'Bliss symbols-An alternate symbol system tor the non-verbal pre-reading child'. In G.C. Vanderheiden and K. Grilley (eds) Non-Vocal Communication Techniques and Aids for the Severely Physically Handicapped. Baltimore: University Park Press.

McNaughton, S. (1985). *Communicating with Blissymbolics*. Toronto, Ontario: Blissymbolics Communication International.

McNaughton, S. (1990). 'Gaining the most from AAC's growing years', Augmentative and Alternative Communication, 6 (1), 2-14.

McNaughton, S. (1993). 'Graphic representational systems and literacy learning', Topics in Language Disorders, 13 (2), 58-75.

McNaughton, S. and Kates, B. (1974). 'Visual symbols: Communication system for the pre-reading physically handicapped child'. Paper presented at the American Association on Mental Deficiency Annual Meeting, Toronto.

McNaughton, S. and Lindsay, P. (1995). 'Approaching Literacy and AAC Graphics', Augmentative and Alternative Communication, 11(4), 212-228.

McWilliam, P.J. and Coleman, P. (1991). 'Literacy and young children with severe impairements'. Paper to the First Carolina Literacy Symposium. North Carolina, USA.

McWilliam, P.J. and Coleman, P. (1992). 'Emerging Literacy and preschoolers with SSPI: Storybook Reading'. Second Caroline Literacy Symposium and Annual NCACA Conference, USA.

Merriam, S., B. (1988). Case study research in education: A qualitative approach. San Francisco, CA: Jossey-Bass.

Merriman, S., (1988). *Case Study Research in Education*, London, Jossey-Bass Ltd.

Mike, D.G. (1987). 'Literacy, technology, and the multiply disabled: An ethnography of classroom interaction', Paper presented at the meeting of the National Reading Conference, St. Petersburg Beach, FL.

Miles, M., & Huberman, A.M., (1994) *Qualitative Data Analysis*, London, Sage Publications.

Miller, G.A. (1981). *Language and Speech.* San Francisco, Freeman.

Milner, (1968). 'Observations on cerebral dominance'. In Oldfield and Marshall (ed)- *Language* . Penguin.

Mirenda, P. (1991). 'Terminology about people", Augmentative and Alternative Communication, 67(1), 59-60.

Mirenda, P. (1992). 'School to post school transition planning for augmentative and alternative communication users', Seminars in Speech and Language, 13 (2), 130-142.

Mirenda, P., and Beukelman, D. (1990). 'A comparison of intelligibility among the natural speech and seven speech synthesizers with listeners from three age groups',

Augmentative and Alternative Communication, 6 (1), 61-68.

Mirenda, P., and Locke, P. (1989). 'A comparison of symbol transparency in nonspeaking persons with intellectual disabilities', Journal of Speech and Hearing Disorders, 54, 131-140.

Mizuko, M. (1987). 'Transparency and ease of learning of symbols represented by Blissymbols, PCS, and Picsyms', Augmentative and Alternative Communication, 3 (3), 129-136.

Mizuko, M., and Reichle, J. (1989). 'Transparency and recall of symbols among intellectually handicapped adults', Journal of Speech and Hearing Disorders, 54, 627-633.

Moerk, E.L., and Moerk, C. (1979). 'Quotations, imitations, and generalizations: Factual and methodological analyses', International Journal of Behavioural Development, 2, 43-72.

Moore, S and Kovach, T. (1993). 'Storybook Reading Coding System'. Third Annual Carolina Literacy Center Symposium, 11 March, North Carolina.

Morris, S.E. (1981). 'Communication/interaction development at mealtimes for the multiple handicapped child: Implications for the use of augmentative communication systems', Language, Speech, and Hearing Services in Schools, 12, 216-232.

Morrow, L.M. (1988). 'Young children's responses to one-to-one readings in school settings', Reading Research Quarterly, 23, 89-107.

Morrow, M.L. , O'Connor, E.M. and Smith, J.K. (1990). 'Effects of a story reading program on the literacy development of at-risk kindergarten children', Journal of Reading Behavior, 12 (3), 255-275.

Musselwhite, C. & King-DeBaun, P., (1997) *Emergent Literacy Success: Merging Technology and Whole Language for Students with Disabilities*. Park City, UT: Creative Communicating.

Musselwhite, C. (1993 A). 'R.A.P.S.: Reading Activities Project For Older Students'. In C. Musselwhite (Eed), Phoenix, AZ: Southwest Human Development.

Musselwhite, C. (1993 B). 'Make it fun and interactive'. Workshop given at the Technical University of Lisbon, Portugal.

Musselwhite, C. and King De-Baun, P. (1993 B). *Emergent Literacy Fun: Merging Technology and Whole Language*. Southeast Augmentative Communication Clinician Series.

Musselwhite, C. and St. Louis, K. (1988). *Communication Programming for Persons with Severe Handicaps- Vocal and Augmentative Strategies*. Second Edition. San Diego: College- Hill Press.

Mustonen, T., Locke, P., Reichle, J., Solbrack, M. & Lindgren, A. 1991. In Reichle, J., York, J. & Sigafoos, J., 1991. I*mplementing Augmentative and Alternative Communication. Strategies for learners with severe disabilities*. Paul Brooks Publishing Co.. Baltimore, Maryland, USA

Ninio, A. and Bruner, J.S. (1978). 'The achievement and antecedents of labeling', Journal of Child Language, 5, 1-15.

Norris, J. and Damico, J. (1990). 'Whole language in theory and practice: Implications for language intervention', Language, Speech, and Hearing Services in the Schools, 21, 212-220.

Norris, L., Parnes, P., Boschen, K., and Schuller, R. (1992). 'Evaluation of a new approach to augmentative communication service delivery'. Augmentative and

Alternative Communication, 8 (2),158.

Nunes da Ponte, M., King-DeBaun, P., and Andrés, P. (1996). 'Different languages similar needs: Tools and Techniques for translating early literacy materials.' Paper to the 7th Biennial Conference of the ISAAC. Vancouver, Canada.

Nunes da Ponte, M.M. (1989). 'A Rute Fala de Maneira Diferente'. I Encontro Luso-Espanhol de Comunicação Não-Vocal, 4-6 December, Complexo Interdisciplinar do IST, Lisbon.

Nunes da Ponte, M.M., and Azevedo, L.M.F., (1993). 'Using microcomputers for alternative and augmentative communication: A project with very young cerebral palsied children', Closing the Gap Conference, Minnesota, USA

O' Hanlon, C. (1993).*Special Education Integration in Europe*. David Fulton Publishers, London.

Orelove, F.P., and Sobsey, D. (1993). *Educating Children with Multiple Disabilities: A Transdisciplinary Approach.* (second edition). Baltimore: Paul Brookes.

Oxenham, J. (1980). *Literacy: Writing, Reading and Social Organisation.* London: Routledge and Kegan Paul.

Paris, S.G., Wasik, B.A. and Turner, J.C. (1991). 'The development of strategic readers'. In: R. Barr, M.L. Kamil, P.B. Mosenthal, and P.D. Pearson (eds), *Handbook of Reading Research* (vol. 2). New York: Longman.

Park, K. (1995). 'Using Objects of Reference: a Review of the Literature', European Journal of Special Needs Education, 10 (1), 40-46.

Patton, M. Q. (1990). Qualitative research and evaluation methods (2nd ed.). Newbury Park, CA: Sage Publications.

Pelligrini, A. and Galda, L. (1982). 'The effects of thematic fantasy play training on

the development of children's story comprehension', American Educational Research Journal, 19, 443-452.

Perry, N. (1960). *Training and the Mentally Retarded Child.* New York, NY: Columbia University Press.

Phillips, V. and McCollough, L. (1990). 'Consultation-based programming: Instituting the collaboration ethic in schools', Exceptional Children, 56, 291-304.

Pierce, P. and McWilliam, P.J. (1993). 'Emerging literacy and children with severe speech and physical impairments (SSPI): Issues and possible intervention strategies', Topics in Language Disorders, 13 (2), 47-57.

Poock, G.K., Blackstone, S.W., and Berg, M.H. (1992). 'Measuring the effectiveness of communication displays: Information theory and multiattribute analysis'. Augmentative and Alternative Communication, 8 (2), 162.

Popper and ECCLES (1977). *The Self and its Brain.* Springer International.

Premack, D. (1971). 'Language in a chimpanzee ?" Science, 172, 808-822.

Premack, D. and Premack, A. (1974). 'Teaching visual language to apes and language-deficient persons'. In R.L. Schiefelbusch and L.Lloyd (eds) *Language Perspectives: Acquisition, Retardation and Intervention* . Baltimore: University Park Press.

Raghavendra, P., Rosengren, E., and Hunnicutt, S. (1992). 'MultiTalk 11: An evaluation of the updated VOCA from Sweden'. Augmentative and Alternative Communication, 8 (2), 162.

Ratcliff, A and Beukelman, D. (1995). 'Preprofessional Preparation in Augmentative and Alternative Communication: State-of-the-Art Report', Augmentative and Alternative Communication, 11 (2), 61-73.

Reichle, J., and Brown, L. (1986). 'Teaching the use of multipage direct selection communication board to an adult with autism', Journal of The Association for Persons with Severe Handicaps, 11, 68-73.

Reichle, J., and Yoder, D. (1985). 'Communication board use in severely handicapped learners;, Language, Speech, and Hearing Services in Schools, 16, 146-157.

Reichle, J., York, J., and Sigafoos, J. (1991). *Communication Programming for Persons with Severe Handicaps: Vocal and Augmentative sSrategies*. Baltimore: Paul H. Brookes.

Reid, B., Jones, L., and Keirnan, C.C. (1983). 'Signs and symbols: The 1982 survey of use', Special Education: Forward Trends, 10, 27-28.

Remington, B. and Clark, S. (1993a). 'Simultaneous communication and speech comprehension, part I: Comparison of two methods of teaching expressive signing and speech comprehension', Augmentative and Alternative Communication, 9(1), 36-48.

Remington, B. and Clark, S. (1993b). 'Simultaneous communication and speech comprehension, part II: Comparison of two methods of overcoming selective attention during expressive sign training', Augmentative and Alternative Communication, 9(1), 49-60.

Robson, C. (1993). *Real World Research: A resource for Social Scientists and Practitioner-Researchers*. Oxford: Blackwells.

Rosegrant, T.J. (1984). 'Fostering progress in literacy development: Technology and social interaction', Seminars in Speech and Language, 5 (1), 47-58.

Rosenshine, B. and Stevens, R. (1984). 'Classroom instruction in reading'. In P. Pearson (ed), *Handbook of Reading Research*.. New York: Longman.

Rowland, C. & Stremel-Campbell, K. (1987). Share and share alike: Conventional gestures to emergent language for learners with sensory impairments. In L.Goetz, D. Guess, & K. Stremel-Campbell (Eds.), *Innovative program design for individuals with dual sensory impairments* Baltimore: Paul Brooks Publishing Co.

Rowland, C. (1992). 'Small 'N' Studies: The Case for More and Better Data'. In D.J. Gardner-Bonneau (ed). 'Methodological Issues in Research in Augmentative and Alternative Communication'. Second ISAAC Research Symposium in Augmentative and Alternative Communication, 12-13 August, Philadelphia.

Rumbaugh, D., Gill, T.V., and Von Glasserfield, E.C. (1973). 'A rejoinder to language in man, monkeys and machine', Science, 185, 871-872.

Ryan, J. (1974). 'Early language development: Towards a communication analysis'. In M.P.M. Richards (ed) *The Integration of a Child into a Social World* . London: Cambridge University Press.

Savage, R.D., Evans, L., and Savage, J.F. (1981). *Psychology and Communication in Deaf Children.* Sydney: Grune and Stratton.

Saya, M. (1979). 'Adult aphasics and the Blissymbol language'. Paper presented at the American Speech and Hearing Association Convention, Atlanta, GA.

Scarborough, H.S., Dobrich, W. and Hager, M. (1991). 'Preschool Literacy Experience and later Reading Achievement', Journal of Learning Disabilities, 24 (8), 508-511.

Schensul, J. J., & Schensul, S. L. (1992). *Collaborative research: methods of inquiry for social change. In M. D. LeCompte,* W. L. Mellroy, & J. Preissle (Eds.), The handbook of qualitative research in education. New York: Academic Press.

Scherer, & McKee, B.G. (1993). "Participatory action research (PAR); What it is,

what it isn't, how it's done, what you get". Paper presented at the Annual Meeting of the American Educational Research Association, Atlanta, G.A.

Schindele, R., (1985) "Research Methodology in Special Education: A Framework Approach to Special Problems and Solutions", in Hegarty, S. & Evans, S. (Eds.), Research and Evaluation Methods in Special Education, Windsor, NFER-Nelson.

Schlosser, R. W. and Braun, U. (1994). 'Efficacy of AAC interventions: Methodologic Issues in evaluating behavior change, generalization, and effects'. Augmentative and Alternative Communication. 10 (3) 207-223.

Schlosser, R.W. (1993). *Roles of Graphic Symbols in Concept Formation by AAC Users*. Unpublished Manuscript.

Schonell, F.E. (1956). *Educating Spastic Children: The Education and Guidance of the Cerebral Palsied.* London: Oliver and Boyd.

Seidel, U.P., Chadwick, O.F.D., and Rutter, M. (1975). 'Psychological disorders in crippled children. A comparative study of children with and without brain damage', Developmental Medicine and Child Neurology, 17, 563-573.

Sevcik, R.A., Romski, M.A. and Wilkinson, K.M. (1991). 'Roles of graphic symbols in the augmented language acquisition process for persons with severe cognitive disabilities', Augmentative and Alternative Communication, 7 (3), 161-170.

Shanahan, T. and Lomax, R.G. (1986). 'An analysis and comparison of theoretical models of the reading-writing relationship', Journal of Educational Psychology, 78, 116-123.

Shane, H. (1981). 'Decision making in early augmentative communication system use'. In R. Schiefelbusch and D. Bricker (eds) *Early Language Intervention.* Austin, TX: Pro-Ed.

Shere, B. and Kastenbaum, R. (1966). *Mother-child Interaction in Cerebral Palsy: Environmental and Psychosocial Obstacles to Cognitive Development.* Genetic Psychology Monographs. Nº 73, 255-335.

Sidman, M., (1971). 'Reading and auditory-visual equivalences', Journal of Speech and Hearing Research, 14, 5-13.

Sidman, M., and Cresson, O.J. (1973). 'Reading and crossmodal transfer of stimulus equivalences in severe retardation.', American Journal of Mental Deficiency, 77, 515-523.

Siegel-Causey, E. & Downing, J. (1987). Nonsymbolic communication development: Theoretical concepts and educational strategies. In L.Goetz, D. Guess, & K. Stremel-Campbell (Eds.), *Innovative program design for individuals with dual sensory impairments* Baltimore: Paul Brooks Publishing Co.

Siegel-Causey, E. & Ernst, B. (1989) Theoretical orientation and research in non-symbolic development. In E. Siegel-Causey & D. Guess, *Enhancing nonsymbolic communication interactions among learners with severe disabilities.*

Sigafoos, J., & York, J., 1991.In Reichle, J., York, J. & Sigafoos, J., 1991. *Implementing Augmentative and Alternative Communication. Strategies for learners with severe disabilities.* Paul Brooks Publishing Co.. Baltimore, Maryland, USA

Silverman, F. (1980). Communication for the Speechless. Englewood Cliffs, NJ: Prentice-Hall.

Silverman, H., McNaughton, S. and Kates, B. (1978). *Handbook of Blissymbolics for Instructors, Users, Parents, and Administrators.* Toronto, Ontario: Blissymbolics Communication International.

Smith-Lewis, M. (1992). 'Augmentative and alternative communication research: The value of qualitative methods'. In D.J. Gardner-Bonneau (ed)

Methodological Issues in Research in Augmentative and Alternative Communication. Second ISAAC Research Symposium in Augmentative and Alternative Communication, 12-13 August, Philadelphia.

Smulyan,L. (1988). The collaborative process in action research. Educational Research Quarterly, 12, 47-56.

Snow, C. and Ninio, A. (1986). 'The contracts of literacy: What children learn from learning to read books'. In W.H. Teale and E.Sulzby (eds) *Emergent Literacy* . Norwood, NJ: Ablex Publishing Co.

Snow, C.E. and Goldfield, B.A. (1983). 'Turn the page please: Situation-specific language acquisition', Journal of Child Language, 10, 551-569.

Song, A. (1979). 'Acquisition and use of blissymbols by severely mentally retarded adolescents', Mental Retardation, 17, 253-255.

Stainback, S. and Stainback, W. (1988). *Understanding and Conducting Qualitative Research.* Dubuque, IA: Kendall/Hunt.

Steelman, J.D., Coleman, P.P., and Koppenhaver, D.A. (1992). 'Minspeek: A tool for developing literacy'. Proceedings of the Annual Minspeak Conference.

Steelman, J.D., Pierce, P.L. and Koppenhaver, D.A. (1993). 'The role of computers in promoting literacy in children with severe speech and physical impairment', Topics in Language Disorders, 13 (2), 76-91.

Stenhouse, L. (1980). 'The study of samples and the study of cases'. British Educational Research Journal, 69 (1).

Stenhouse, L. (1981). "What Counts As Research?" British Journal of Educational Studies. Vol. 29, N. 2 June.

Stenhouse, L.(1978). Case Study and Case Records: towards a contemporary history

of education. British Educational Research Journal, Vol. 4, No. 2.

Stillman, R., Alymer, J., & Vandivort, J. (1983). The functions of signalling behaviours in profoundly impaired deaf-blind children and adolescents. Paper presented at the 107th annual meeting of The American Association on Mental Deficiency, Dallas, TX.

Strickland, D. and Morrow, L. (1989). *Emerging Literacy: Young Children Learn to Read and Write*. Newark, DE: International Reading Association.

Sulzby, E. and Teale, W. (1991). 'Emergent literacy'. In R. Barr, M.L. Kamil, P. Mosenthal and P.D. Pearson (eds) *Handbook of Reading Research*, volume II. New York: Longman.

Sulzby, E. and Teale, W. and Kamberelis, G. (1989). 'Emergent writing in the classroom: Home and school connections'. In D. Strickland and L. Morrow (eds) *Emerging Literacy: Young Children Learn to Read and Write*. Newark, DEL: International Reading Association.

Syder, D. (1992). *An Introduction to Communication Disorders*. Chapman and Hall. London.

Tawney, J. and Gast, D. (1984) *Single Subject Research in Special Education.* Columbus Ohio: Merril Publishing.

Teale, W. (1984). 'Reading to young children: Its significance for literacy development', In H. Goelman, A. Oberg, and F. Smith (eds) *Awakening to Literacy*. Exeter, NH: Heinemann Educational Books.

Teale, W. (1987). 'Emergent Literacy: Reading and writing development in early childhood'. In J.E. Readence, R.S. Baldwin, J.P. Konopak, and H. Newton (eds) *Research in Literacy: Merging Perspectives* (36th yearbook of the National Reading Conference). Rochester, NY: The National Reading Conference.

Teale, W. and Sulzby, E. (1986). *Emergent Literacy: Writing and Reading.* Norwood, NJ: Ablex.

Tindal, G., Shinn, M.R., and Rodden-Nord, K. (1990). 'Contextually based school consultation: Influential variables', Exceptional Children 56, 324-336.

Trevarthen, C. (1983). 'Development of the cerebral mechanisms for language'. In V. Kirk (ed) *Neuropsychology of Language. Reading and Spelling.* New-York: Academic Press.

Tronick, E. (1981). 'Infant communicative intent: The infant's reference to social interaction'. In R.E. Stark (ed) *Language Behavior in Infancy and Early Childhood.* New York: Elsevier.

Udwin, O. and Yule, W. (1990). 'Augmentative communication modes taught to cerebral palsied children: A longitudinal study'. British Journal of Communication Disorders, 25, 295-309.

Van Osterom, J., and Devereux, K. (1984). *Learning with Rebus.* Stratford: N.C.S.E.

Van Osterom, J., and Devereux, K. (1985). Learning with Rebus Glossary. Cambridgeshire: Earo.

Vanderheiden, G.C., and Lloyd, L.L. (1986). 'Communication systems and their components'. In S.W. Blackstone (ed) *Augmentative Communication: An introduction.* Rockville, MD: American Speech-Language-Hearing Association.

Vanderheiden, G.C., and Yoder, D.E. (1986). 'Overview'. In S.W. Blackstone (ed), *Augmentative Communication: An introduction.* Rockville, MD: American Speech-Language-Hearing Association.

Von Tetzchner, S. and Martinsen, H. (1992). *Introduction to Symbolic and*

Augmentative Communication. San Diego: Singular Publishing Group, Inc

Vygotsky, L. (1962). *Thought and Language*. Cambridge, MA:MIT Press.

Vygotsky, L. (1978). '*Mind in Society: The development of higher psychological processes*'. In M. Cole, V. John-Steiner, S. Scribner, and E. Souberman (Eds.). Cambridge, MA: Harvard University Press.

Walker, M. (1973). *An Experimental Evaluation of the Success of a System of Communication for the Deaf Mentally Handicapped*. Unpublished master's thesis, University of London.

Walker, M. (1987). 'The makaton vocabulary: Uses and effectiveness'. Paper presented at the first International AFASIC Symposium, University of Reading, England.

Walker, M., Cousins, S., Parsons, F., and Carpenter, B. (1985). *Symbols for Makaton*. Surrey: E.A.R.O. / M.V.D.P.

Wasson, P. and Keeler, J. (1984). *Changing Response Ratios of Normal and Handicapped Children*. Unpublished raw data.

Wells, G. (1985a). *Language Development in the Preschool Years*. New York: Cambridge University Press.

Wells, G. (1985b). 'Preschool literacy-related activities and success in school'. In D.R. Olson, N. Torrance, and A. Hildyard (eds) *Literacy, Language, and Learning: The Nature and Consequences of Reading and Writing*. Cambridge: Cambridge University Press.

Wells, G. (1987). 'The learning of literacy'. In B. Fillion, C. Hedley, and E. DiMartino (eds) *Home and School: Early Language and Reading*. Norwood, NJ: Ablex Publishing Co.

Wexler, K., Dore, J. and Blau, A. (1982). 'Conversational functions of the nonvocal/vocal dyad'. Short course presented at the American Speech-Language-Hearing Convention, Toronto.

Whitley, K. (1985). 'Picture communication symbols (PCS): A review", Augmentative Communication, 3 (1), 3.

Whyte, W. F. (1991). Introduction. In W. F. Foote (Ed.), Participatory Action Research. Newbury Park, CA: Sage Publications.

Williams, M. (1995). Thoughts of the Future. Outcomes in AAC. Conference Report. Blackstone, S. and Pressman, H. at Alliance 95, Monterey, CA.

Williams, M.B. (1994). 'Time to get in the mix', Alternative Speaking, 1(1), 1-3.

Yoder, D.E. and Koppenhaver, D.A.(1993) 'Literacy learning and persons with severe speech impairments', Topics in Language Disorders, 13 (2).

Yoder, D.E. and Kraat, A. (1983). 'Intervention issues in nonspeech communication', In J. Miller, D. Yoder, and R.L. Schiefelbusch (eds) *Contemporary Issues in Language Intervention.* ASHA Reports 12, 27-51. Rockville, MD: American Speech-Language-Hearing Association.

Yorkston, K. and Karlan, G. (1986). '.Assessment Procedures'. In S. Blackstone (ed) *Augmentative Communication: An Introduction.* (pp. 163-196). Rockville, MD: American Speech-Language-Hearing Association.

Zangari, C., Lloyd, L.L., and Vicker, B. (1994). 'Augmentative and Alternative Communication: An Historic Perspective', Augmentative and Alternative Communication, 10 (1), 27-59.

Appendices

APPENDIX 1

Photo 1: NUNO

Photo 3: ANDRÉ

Photo 2: JOÃO

Photo 4: Classroom: Enlarged commun. board

Photo 5: Classroom: Engineering the Classroom. Circle Area

Photo 6: Daily Routine: Circle Time

Photo 7: Symbol's Communication Vest

Photo 8: Daily Routine:
Choice making (direct selection).

Photo 9: Daily Routine: Children's Day Presence's.

Photo 10: Daily Routine: Etran for eye gaze selection Switch Interface.

Photo 11: Augmentative Music: Choice Making

Photo 12: Augmentative Music: Symbol Song Board. Switch Mate™ (Digitised speech).

Photo 13: Augmentative Music: Children "sing" using a voice out put device.

Photo 14: Story Time: Repetitive Line, using a Switch Mate™

Photo 15: Light Pointer for Direct Selection

Photo 16: Group of children in this research study

Photo 17: Page Fluffers, for independent page turning.

Photo 18: "Little Piglet" Story. Printed text and symbol sentences.

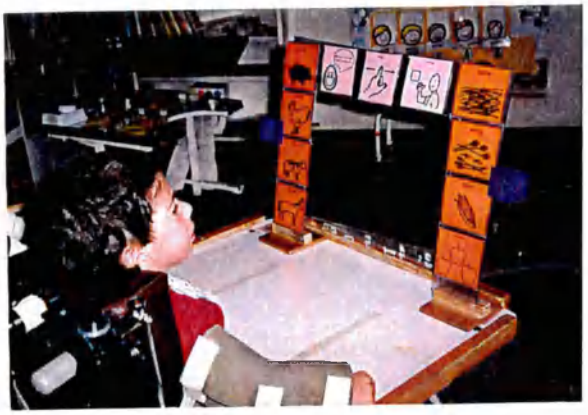


Photo 19: "Little Piglet" Story Specific Commun. Board. Etran frame, for eye gaze selection.

Photo 20: "Little Piglet". Story Props for story retelling

Photo 21: "Little Piglet". Animals/Food correspondence

Photo 22: Intervention Group Sessions.

Photo 23: Peer Interaction: Questioning and Answering

Photo 24: Repetitive Line (visual and auditory feed back) Cheap Talk™

Photo 25: "Little Piglet" Macaw II™ (Overlay 1- Animals)

Photo 26: Independent Reading: Macaw II (Overlay 3)

Photo 27: Independent Reading. Dial Scan: symbol sentences

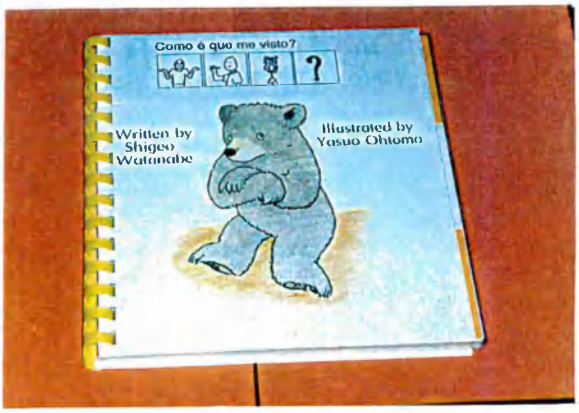


Photo 28: "How do I put it on". Adapted for physical access.

Photo 29: Creating Materials: Symbol words and symbol sentences.

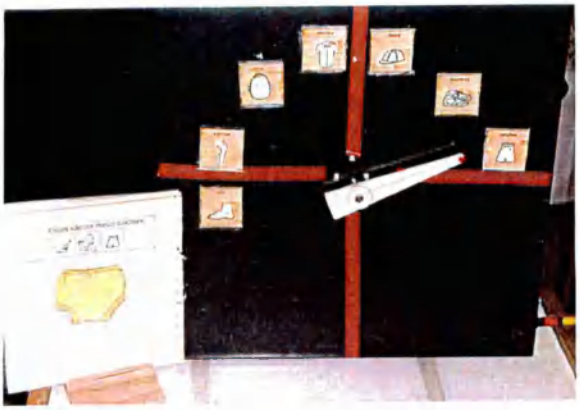


Photo 30: Dial Scan: Symbol Words matching the book.

Photo 31: Dial Scan: Symbol /Word Correspondence.

Photo 32: Dial Scan: "Pretend Reading" Symbol sentences.

Photo 33: Dial Scan: "Simultaneous Reading" Symbol sentences and printed text.

Photo 34: "How do I put it on" Puppets for Story retelling

Photo 35: Matching Symbol sentences with story characters.

Photo 36: Story retelling: Matching symbol sentences with sequences of events.

Photo 37: Story retelling: Repetitive Line: "do I put it on like this?" (Voice output device)

Photo 38: Story retelling: Syntax (composing the sentence by copying from a model).

Photo 39: Writing: Composing the sentence (left to right progression)

Photo 40: Story related activities: using puppets

Photo 41: Macaw II: Overlay 4 (clothing)

Photo 42: Writing Activities: Symbol Mini-books for writing.

Photo 43: Writing Activities: Dial Scan. Symbol selection to fill in mini-books.

Photo 44: Writing Activities: Etran frame. Symbol selection to fill in mini-books.

Photo 45: Writing Activities: Relate to child's own experience. Nuno asked for his new cap.

Photo 46: Story Writing: Ke:nx Interface. Printed text output

Photo 47: Story Writing: Ke:nx. Children worksheets.

Photo 48: Story Writing: Writing in words a sentence presented in symbols.

Photo 49: Story Writing: Printing is the final product.

Photo 50: Story Writing: Drawing and Scribbling (with help).

Photo 51: Story Writing: Print Understanding. Nuno asked to send it home for mummy.

APPENDIX: 2

Ke:nx Setups

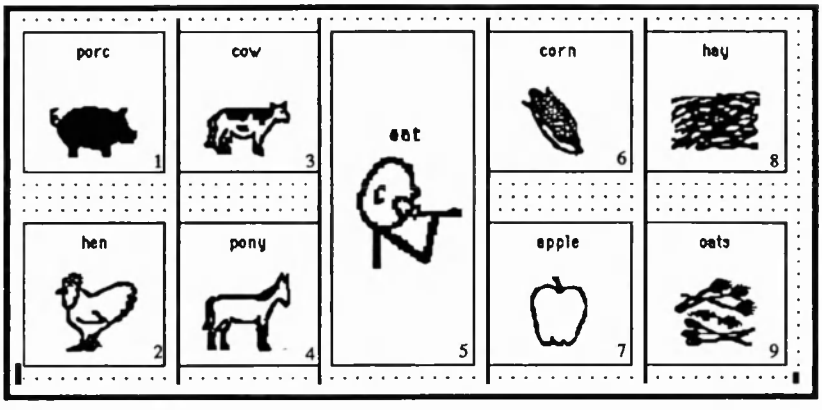


Figure A1 : Computer Screen with "Little Piglet" Ke:nx Setup 1

Table A1: Computer Functions with "Little Piglet" Ke:nx Setup 1

Look (symbol)	**Sound** (digitised speech)	**Act** (printed text)
1	Little Piglet	Little Piglet + space
2	the hen	the hen + space
3	the cow	the cow + space
4	the pony	the pony + space
5	eats	eats + space
6	corn	corn + space
7	apples	apple + space
8	hay	hay + space
9	oats	oats + space

APPENDIX: 2 cont.

Ke:nx Setups

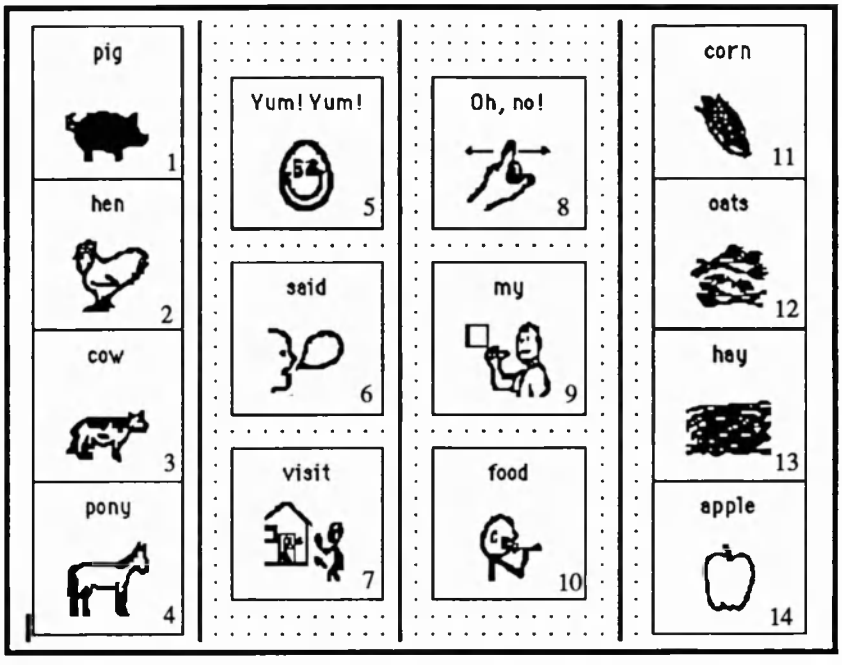


Figure A2 : Computer Screen with "Little Piglet" Ke:nx Setup 2

Table A2 : Computer Functions with "Little Piglet" Ke:nx Setup 2

Look (symbol)	**Sound** (digitised speech)	**Act** (printed text)
1	Little Piglet	Little Piglet + space
2	the hen	the hen + space
3	the cow	the cow + space
4	the pony	the pony + space
5	Yum! Yum!	Yum! Yum! + space
6	said	said + space
7	visited	visited + space
8	Oh, no!	Oh, no! + space
9	my	my + space
10	food	food + space
11	corn	corn + space
12	oats	oats + space
13	hay	hay + space
14	apples	apples + space

APPENDIX: 2 cont.
Ke:nx Setups

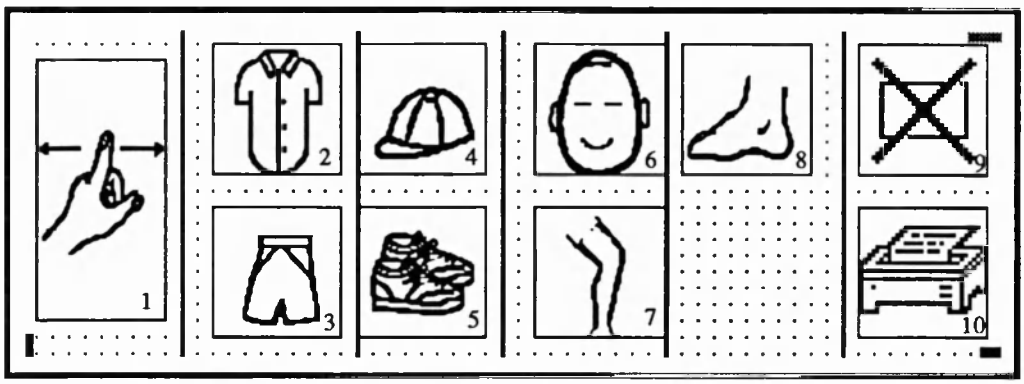


Figure A3: Computer Screen with "How do I put it on?" Ke:nx Setup 3

Table A3: Computer Functions with "How do I put it on?" Ke:nx Setup 3

Look (symbol)	**Sound** (digitised speech)	**Act** (printed text)
1	No!	No! + space
2	shirt	shirt + space
3	pants	pants + space
4	cap	cap + space
5	shoes	shoes + space
6	head	head + space
7	legs	legs + space
8	feet	feet + space
9	delete	function for deleting
10	print	function for printing

APPENDIX: 2 cont.
Ke:nx Setups

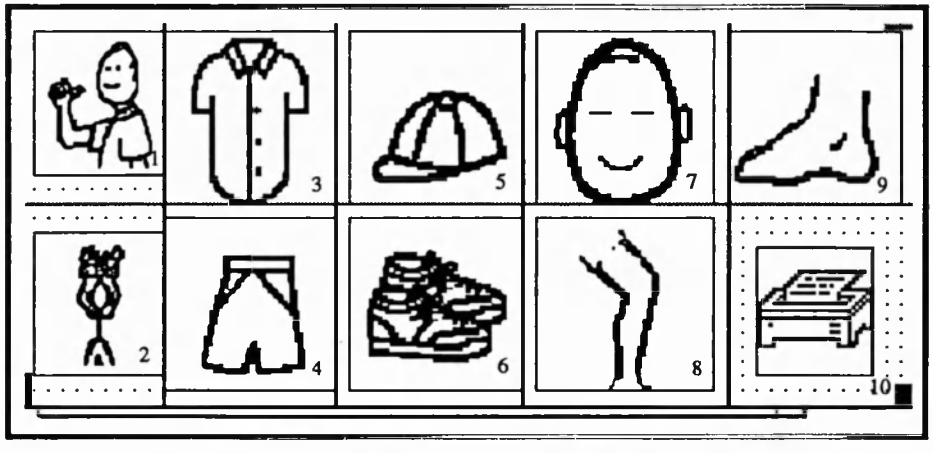
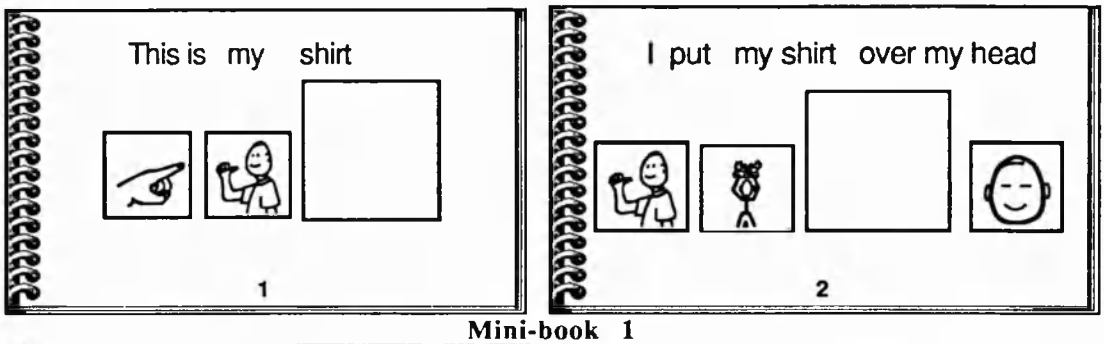


Figure A4: Computer Screen with "How do I put it on?" Ke:nx Setup 4

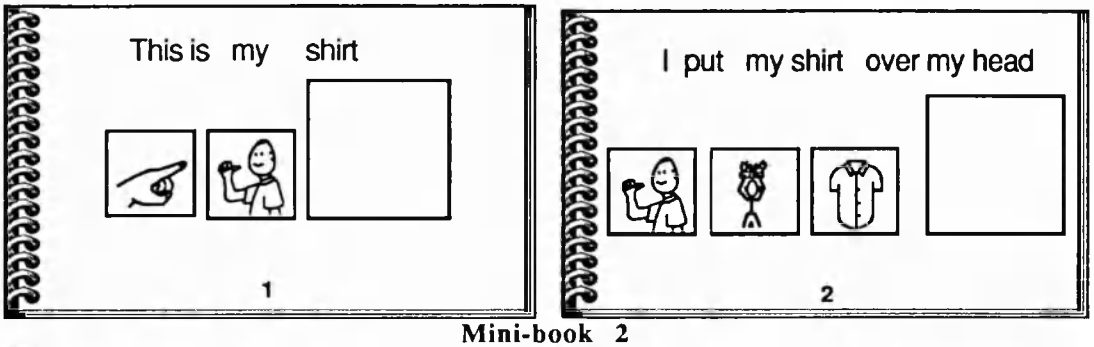
Table A4: Computer Functions with "How do I put it on?" Ke:nx Setup 4

Look (symbol)	Sound (digitised speech)	Act (printed text)
1	I	I + space
2	put	put + space
3	my shirt	my shirt + space
4	my pants	my pants + space
5	my cap	my cap+ space
6	my shoes	my shoes + space
7	on my head	on my head + space
8	* on my legs	on my legs + space
9	on my feet	on my feet + space
10	print	function for printing

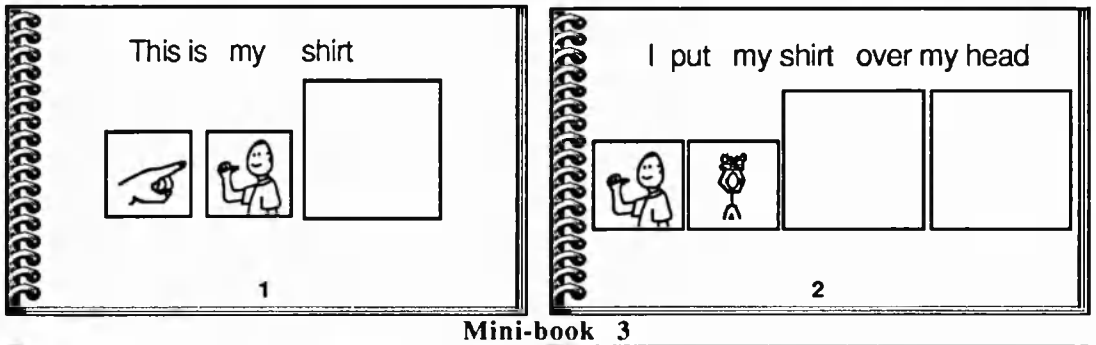
APPENDIX 3: The Mini-Books



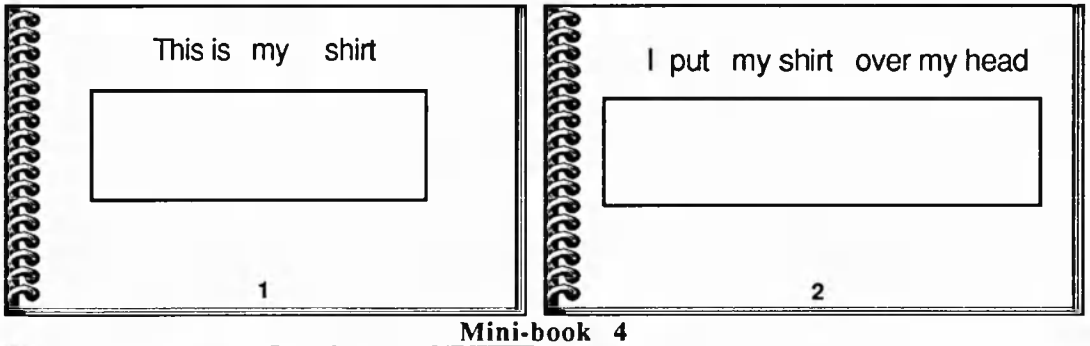
Mini-book 1



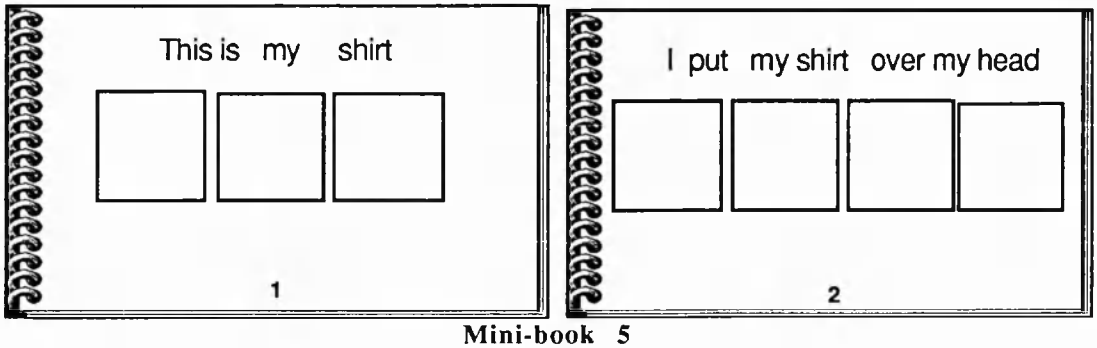
Mini-book 2



Mini-book 3



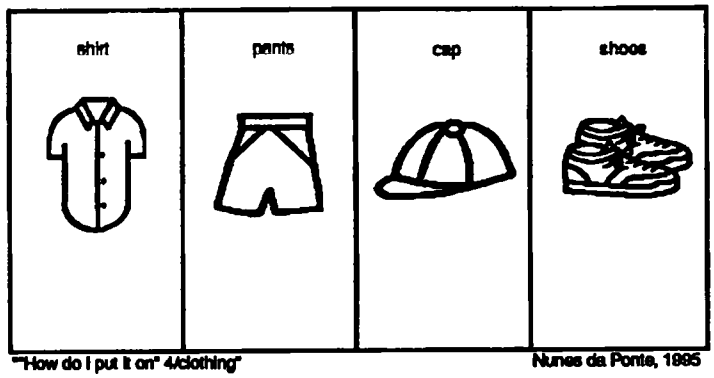
Mini-book 4



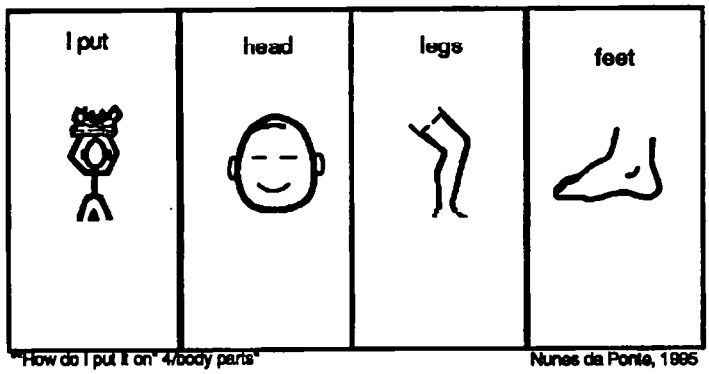
Mini-book 5

APPENDIX: 4

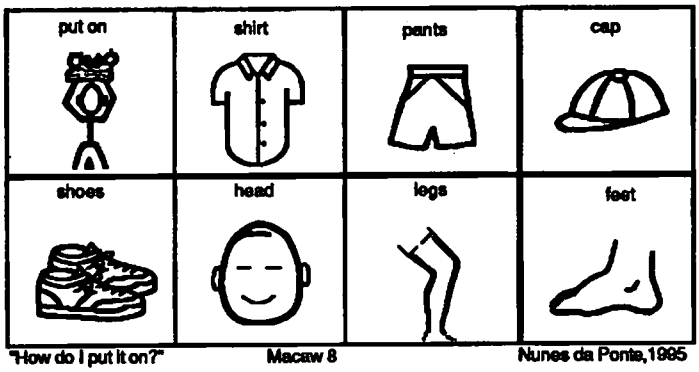
Macaw:



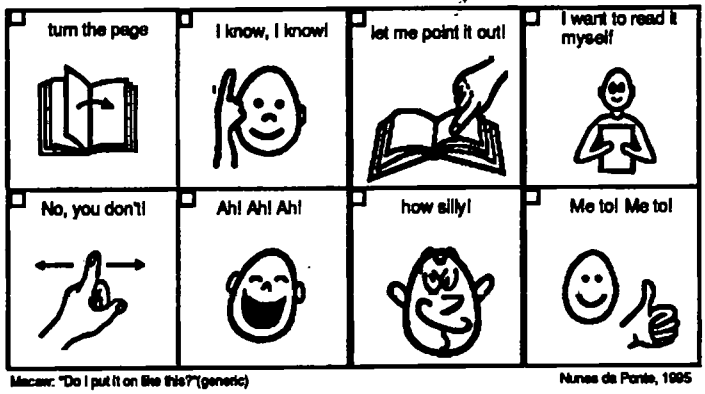
"How do I put it on" 4/clothing" Nunes da Ponte, 1995



"How do I put it on" 4/body parts" Nunes da Ponte, 1995



"How do I put it on?" Macaw 8 Nunes da Ponte,1995



Macaw: "Do I put it on like this?"(generic) Nunes da Ponte, 1995

APPENDIX 5:

The Coding System for the Children's Communicative Behaviours

adapted from Blackstone, 1989; McWilliam, & Coleman, 1991; Light & Kelford-Smith, 1993; Light , Binger, & Kelford-Smith, 1994; Moore & Kovach 1993

c1- Labels or Comments:

A child's label of or comment on a picture or event related to the story appears in this category. Included are children's responses to adults' open ended questions about and "reading" of the story. Both children's initiations as well as their response to adult's' comments, requests, or other interactions belong here.

c2- Answering Yes/no questions:

Responses to questions about the story (be they affirmative or negative),appear here as do answers to adults' requests for clarification.

c3- Asking questions:

This category includes children's questions about the story, including requests for information about the people, objects, events, or pictures in the story book.

c4- Relating experience:

These comments relate the story to the child's own experience by asking questions or making comments.

c5- Predicting:

When a child predicts what is going to happen next, anticipates the sequence of events, or guesses what is the story about, those comments appear here.

c6- Off topic comments:

Any comments or questions not relevant to the story, the book or the child's experiences related to the story belong here.

c7- Asking to turn the page:

Communications relating to page turning, whether the child wants to do so himself or requests that it be done for him, are included in this category.

c8-Asking to point to the pictures or to the text:

If a child asks the adult to point to the pictures or words in the book, the request is recorded here.

c9- Asking to read the text by himself:

This category registers instances in which the child asks to read himself, taking the adult's role.

c10- Filling in a word or a sentence:

Those utterances in which the child appropriately fills in a symbol/word or a symbol/sentence by matching a symbol with the story's text appear here as do those in which the child pretends to read the book or sentence himself.

c11- Reading the book/sentence with the adult:

Recorded here are those occasions in which the child "reads" the text at the same time as the teacher by pointing to the words or symbols. The child is supposed to look at pictures/symbols/words while reading, maintaining a visual scanning.

c12- Performing Actions:

Actions performed during the story (with the adult's support) including turning pages, lifting flaps and pointing to pictures appear in this category.

c13 - Unintelligible Acts:

This category takes in any acts on the part of a child which are intended to be communicative but which are not interpretable.

c14- Others:

This category includes everything observeable but which cannot be included elsewhere. Such observations were specified and described.

APPENDIX 5 (cont.)

Coding System for Adults' Communicative Behaviours:

adapted from Blackstone, 1989; McWilliam, & Coleman, 1991; Light & Kelford-Smith, 1993; Light , Binger, & Kelford-Smith, 1994; Moore & Kovach 1993.

a1- Labels or comments:

Communicatons labeling objects, people, or actions in the book or its pictures; descriptions of events in the story are included here. Comments about the story, (with the exception of attempts to relate the story to the child's personal experiences) also appear here.

a2- Yes/no questions:

This category includes questions about pictures or events in the story (but not those relating the story to the child's personal experiences) which require a yes/no response. Requests for confirmation from the child do not appear here.

a3- Open-ended questions:

Open ended (wh-questions) questions about the pictures or events in the story enter into this category as do requests for labels. Once again, questions about the child's personal experiences are excluded.

a4- Relating the story to experience:

All types of questions relating the story to the child's experience belong in this category (examples include "Why" questions, yes/no questions or comments linking the story to the child's personal experiences.)

a5- Predictions:

This category includes the adults' use of strategies to encourage the child to anticipate story events. For example, the adult might ask who the book is about or if the the child wants to guess what will happen next.

a6- Directives:

Communications intended to guide the children to perform an action appear in this category, including requests to point to a picture, or to lift a flap, etc. Comments on the mechanics of book reading also appear here including requests for attention, and comments similar to the following: "start at the beginning", "look at the words", and "don't turn the page yet because we have to read it first".

a7- Off topic comments:

Comments or questions unrelated to the story, the book appear here. Typical comments in this group include responses to child's initiations about the environment and comments on the environment. e.g. "Do you want to go to the bathroom?"

a8- Confirmations/Expanding/Clarifications:

Those comments which follow a child's turn and in which the adult confirms his attempts to communicate, gives him positive feedback, or comments on his utterances either by interpreting them, expanding upon them or requesting clarification of them are placed in this category.

a9- Reading the text:

Located in this category are adults' exact readings of the text combined with the action of pointing to the words/sentences or symbols/sentences being read.

a10- Encouraging the child to Read:

When an adult encourages the child to become involved in interpreting the text, either by pausing for the child to read or to fill in a word, or to repeat a well known or phrase, or by asking the child if he wants to read himself, these utterances are place in this category.

a11- Simultaneous Reading:

This category includes utterances in which, according to a cued reading approach, the adult reads the text with the child, making him touch the words as if he were reading

himself.

a12- Providing Support:

Additional support includes modelling the child's answer, giving him clues, and telling him what he is supposed to do. Such comments use a scaffolding approach to ensure comprehension such as pointing to the symbol "turn the page", or using his AAC device, when waiting for the child to ask to turn the page.

a13- Pointing to symbols or words while talking or reading:

When the adult models communication by simultaneously using her normal mode of communication and that of the child, highlighting key concepts by using either his/her communication display or the child's (for example, the adult might make use of an AAC voice output device)the comment appears here.

a14- Repetition:

Repetitions of previous questions or sentences, intended to facilitate the child's comprehension or to improve his participation by illustrating the expected response, belong in this category .

a15- Others:

This category received all the previously unclassified comments to be subsequently specified and described.

APPENDIX 6: Questionnaire
"DAILY LIVING EXPERIENCES"

Name:

Age: Date:

Name of the family member :

Relationship with the child :

GENERAL INFORMATION -

1. Names of all of the members in the family (indicate ages and relationship, if appropriate):

2. Any special nicknames for the child?

3. List names of child's closest adult friends:

4. List names of child's closest peers (indicate relationship; example, cousin):

5. List names and types of family pets:

6. What activities your child enjoys:

7. What activities your child dislikes:

8. Indicate favourite foods:

9. Indicate foods the child dislikes:

10. Favourite places the child goes:

11. Any special trips or vacations?

12. Favourite toys? (Please note any special adaptations.)

13. Please describe any vision or hearing problems, as you understand them.

14. Does your child have any special fears? Particular dislikes?

15. Special favourites?

    Song:

    Colour:

    Fast food restaurant (s):

Sport (s):
TV show (s):
Book (s):
Special phrases used at home:
Other:

16. How much time does your child spend with you in an average day?
Weekday
Weekend

17. Briefly describe how your child typically spends his/her day.
Morning
Afternoon
Evening
Saturday
Sunday

LIFE SKILLS

Please indicate how your child performs in the following life skills:

I - SELF-HELP

1- Self Care Dressing

1- Does without prompting
2- Does with prompting
3- Requires some assistance
4- Requires total assistance
5- No opportunity to occur - not expected

2- Self Help Eating

1- Does without prompting
2- Does with prompting
3- Requires some assistance
4- Requires total assistance
5- No opportunity to occur - not expected

3- General Self Care (such as brushing teeth, going to toilet, etc.)

1- Does without prompting
2- Does with prompting

3- Requires some assistance

4- Requires total assistance

5- No opportunity to occur - not expected

Please indicate how your child performs in the following life skills:

1	2	3	4	5	6
Not Able	Limited Ability	Low Average	Average Ability	Good Ability	Exceptional Ability

4- Motor Skills (such as using a pencil or cutting with scissors)

1 2 3 4 5 6

5- Occupation (chooses and stays with activities such as play with toys or imitation of adult behaviours)

1 2 3 4 5 6

6- Socialisation (such as conversing with adults and playing with other children)

1 2 3 4 5 6

II- COMMUNICATIVE STATUS:

1. How well does your child understand what other people say in conversations or play? (For example: during dinner table conversation, at play, following directions or discussing behaviour)

1 2 3 4 5 6

2. How well can your child make other people understand what she/he wants to say? With family members (For example: telling about what they want, dinner time conversation, talking while at play)

1 2 3 4 5 6

3. How well can your child make other people understand what she/he wants to say? With Persons other than family members (For example: talking with people on the street, talking with unfamiliar children)

4. Do you see a discrepancy between what he/she understands and what he/she is able to express to others?

III - MODES OF COMMUNICATION:

Does your child use specific gestures or vocalisations for specific activities or items? e.g. makes sucking sound when thirsty. which of the following ways does your child use to express his/her needs and wants, convey emotions and interact socially:

- speech
- conventional gesture (e.g.: shaking head for "no", waving for good bye)
- nonritualized gestures (e.g.: reaching for or pushing away objects, flapping hands to show excitement)
- pointing
- vocalisation (e.g.: any sounds made with the voice)
- facial expression
- eye gaze
- photographs
- line drawings
- symbols

Which two modes of communication are used most often?

IV - COMMUNICATION FUNCTIONS

In the answers to the following questions, tell how your child communicates each behaviour. Sometimes you will be asked to tell whether the child uses gestures or voice or both using the following examples: pointing, showing or imitating an action, making any noise or using speech.

1. Does the child greet you and/or others? Please describe. (Greeting/closing)

2. Does the child watch you and/or what you are doing? Please describe. (Attention to the partner/referent)

3. Does your child indicate a yes/no response? If yes, how?

4. How does your child get your attention? Please describe. (Request for attention)

5. What does your child do when items (desirable and undesirable) are offered to him/her? Does your child reach for the items or push them away? Please describe. (Acceptance and rejection)

6. Does your child participate in turn-taking activities? Please describe. (For example, rolling a ball back and forth with another person. (Reciprocal action)

7. Does your child ever spontaneously request objects or activities which are present within the immediate environment (For example: in the room but out of reach)? Please describe. (Request for objects/actions within immediate environment)

8. Does your child request objects or activities which are not present within the immediate environment (For example, objects outside the room or past events)? Please describe. (Request for objects/actions outside immediate environment)

9. Does your child make choices between offered objects or activities? How does he indicate his choice? (Communication of choices)

10. Does your child request your assistance when he/she needs help? Please describe. (Request for assistance)

11. How does your child ask for information how something works or asking for the name of something.) Please describe? (Request for information)

12. If you are sharing an activity with your child, and it is interrupted, what does your child do? Does your child reacts or look to you to continue? Please describe. (Indication of interrupted activity).

13. Does your child ever appear frustrated or displeased? (Indication of protest/rejection)

If so, how often?

About what?

How does your child show frustration and displeasure? Please describe.

14. Does your child label, describe or provide information about people, activities or objects which are present within the immediate environment? Please describe. (Comment on referent within the immediate environment)

15. Does your child label, describe or provide information about people, activities or objects which are not present in the immediate environment? Please describe.

(Comment on referent outside the immediate environment)

V - SOCIAL SKILLS

1	2	3	4	5	6
Never	Occasionally	Half of the Time	Often	Most of the Time	Always

1. Can your child start a conversation? (Initiation)

1 2 3 4 5 6

2. Can your child carry-on conversation once it is started? (Maintenance)

1 2 3 4 5 6

3. Can your child tell you about things they have done or that have happened to them? (Topic)

1 2 3 4 5 6

4. Can your child give you more information when you do not understand him/her? (Clarification)

1 2 3 4 5

Please describe what your child does to help you understand him/her.

5. Can your child ask questions when he/she does not understand you? (Ask questions)

1 2 3 4 5 6

Please describe what your child does when he do not understand you.

6. Do other children include your child when they are playing or talking together? (Peers communication)

1 2 3 4 5 6

7. Does your child take turns in conversation? (Turn taking)

1 2 3 4 5 6

8. Does your child interrupt when others are speaking? (Wait for his turn)

1 2 3 4 5 6

9. Does your child talk off topic?

1 2 3 4 5 6

10. Can you understand what your child says?

1 2 3 4 5 6

11. Does your child have any distracting behaviours during conversation?

1 2 3 4 5 6

Please describe any distracting behaviours your child has during conversation.

12. How would you describe your child?

13. Describe as best you can his/her communication problems.

14. What are your main concerns regarding your child? Please indicate in order of importance to you.

15. Give examples of the types of things he/she might ask for or talk about if he/she could speak.

16. Please add any other information you feel might be important when addressing you child's communication needs.

APPENDIX 6 (cont.): Questionnaires

"LITERACY EXPERIENCES"

Adapted from: Light and Kelford Smith, (1993)

I. Background information

1. Name of the person completing the form

2. Relationship to the child

3. Age and birthday of your preschool-aged child

4. Is your child currently attending a school program?
If so, where?

5. What is the primary language spoken in your home?

6. What is your occupation?

7. What is your spouse's occupation?

II. Information about your child's activities

1. From your point of view, which of the following activities is most important for your child to learn at this time? Please rank order from 1-8 with 1=most important and 8=least important.

____ feeding him/herself
____ toilet training
____ dressing him/herself
____ independent mobility (moving around independently)
____ communicating effectively
____ learning to read
____ learning to write with a pencil or computer
____ making friends
____ other

Why are these activities most important at this point in time?

2. What are your child's favourite activities?

3. Approximately how much time does your child spend in the following activities on a typical day?

	week day	weekend
eating	_____	_____
toileting	_____	_____
dressing	_____	_____
phys. ther. act	_____	_____
talking (communicating) to you or others		
	_____	_____
reading act.	_____	_____
writing act.	_____	_____
playing	_____	_____
going on outings (e.g., store, park)		
	_____	_____

4. What television programs does your child usually watch?

5. Is reading something you or others in your family enjoy?

6. How often do you or does someone else in your household read at home? (Check one only)

_____ seldom
_____ 2-3 times
_____ a week
_____ once a day
_____ many times
_____ a day

7. Describe these reading activities (e.g., mom reads novels, recipes, work related materials; dad reads newspaper, magazines; brother reads books from school, sports magazines).

8. What printed materials are available in your home?

_____ magazines
_____ novels and other adult books
_____ adult encyclopaedias
_____ advertisements
_____ posters
_____ catalogues
_____ newspapers
_____ letters

_____ children's magazines
_____ children's books
_____ children's picture books
_____ children's dictionaries
_____ children's encyclopaedias
_____ T.V. guides
_____ other

9. How often does your child use any of these printed materials? (Check one only)

_____ seldom
_____ 2-3 times
_____ a week
_____ once a day
_____ many times
_____ a day

If so, which ones are his/her favourites? (Please provide titles.)

10. How does your child use these printed materials? (e.g., looks at the pictures, flips through the pages, listens while an adult reads)

11. Is your child interested in reading activities? (Check one only)

_____ not at all _____ somewhat _____ very much

If so, how does he/she show this interest?

12. Do you or does anyone else in your household read to your child? If so, how often? (Check one only)

_____ seldom
_____ 2-3 times
_____ a week
_____ once a day
_____ many times
_____ a day

13. Does your child own any books?
If so, approximately how many?

14. Does your child borrow books from the library?
If so, approximately how many books does he/she borrow in a month?

15. What are your child's favourite books? (Please provide titles.)

16. Approximately how many times have you (or someone in your household) read

your child's favourite book to him/her?

17. When you or someone in your household reads to your child, how much time do you/they spend during a reading session? (Check one only)

_____ less than 5 minutes
_____ 5-15 minutes
_____ approximately 30 minutes
_____ approximately an hour
_____ more than an hour

18. What time of day do you or does someone in your household usually read to your child?

19. When you or someone in your household reads to your child, do you usually read a new book or re-read old books?

20. When you or someone in your household reads a book with your child, what does your child do?

_____ listens quietly to the story
_____ looks at the pictures
_____ turns the pages
_____ points to the pictures
_____ answers your questions
_____ asks questions
_____ tries to guess what will happen next
_____ other

21. When you or someone in your household reads a book with your child, how does your child usually communicate with you?

_____ vocalisations
_____ speech
_____ gestures and/or pointing to items in the environment
_____ facial expressions/body language
_____ augmentative communication display or voice output device
_____ manual signs
_____ pointing to or looking at the picture in the story book
_____ other

22. How is your child usually positioned during reading activities?

_____ in a special chair

_____ at a table
_____ in his/her wheelchair
_____ on an adult's lap
_____ beside an adult on the sofa
_____ lying in bed at bedtime
_____ other

23. When you read a book with your child, what do you usually do?
_____ read the text in the book
_____ point to the pictures and label them
_____ point to the words in the book
_____ ask your child to label the pictures (e.g., What's this?)
_____ ask your child to point to the pictures (e.g., Where is the ___?)
_____ ask your child what will happen next
_____ ask your child to explain why something happened
_____ other

24. Is writing or drawing something you or others in your household enjoy?

25. How often do you or does someone in your household write or draw at home? (Check one only)

_____ seldom	_____ once a day
_____ 2-3 times	_____ many times
_____ a week	_____ a day

26. Describe these writing or drawing activities (e.g., mom writes letters, shopping lists, notes for work; sister writes for school, poetry; brother draws spaceships).

27. What writing or drawing materials are available within your home?
- pencil/pen & paper
- magnetic/felt letters
- crayons, paints, magic markers
- chalk & chalkboard
- computer (If so, whose?)
- typewriter (If so, whose?)
- other

28. How often does your child use any of these writing or drawing materials? (Check

one only)

_____ seldom _____ once a day

_____ 2-3 times _____ many times

_____ a week _____ a day

29. Is your child interested in writing and drawing activities?

_____ not at all _____ somewhat _____ very much

If so, how does he/she show this interest?

30. What are your child's favourite writing or drawing activities?

31. When your child is involved in reading or writing activities, does anyone else participate?

_____ Yes _____ No

If yes, who usually participate?

- yourself
- your spouse
- baby-sitter
- older brother or sister
- younger brother or sister
- friend
- teacher
- other

32. Who usually initiates these reading or writing activities?

- your child
- yourself
- your spouse
- baby-sitter
- older brother or sister
- younger brother or sister
- friend
- teacher
- other

33. Does your child participate in any of the following activities? If so, please indicate how often he/she participates in each activity.

- Visit the library? How often?
- Go to bookstores? How often?
- Listen to stories on tapes or records? How often?
- Complete reading or writing workbooks? How often?
- Other

34. In your opinion, whose responsibility is it to teach your child to read and write? Please rank order from 1-5, with 1=most responsibility and 5=least responsibility

_____ mother
_____ father
_____ brothers/sisters
_____ baby-sitter
_____ teacher
_____ other

35. Do you have any additional comments or observations you would like to share with us?